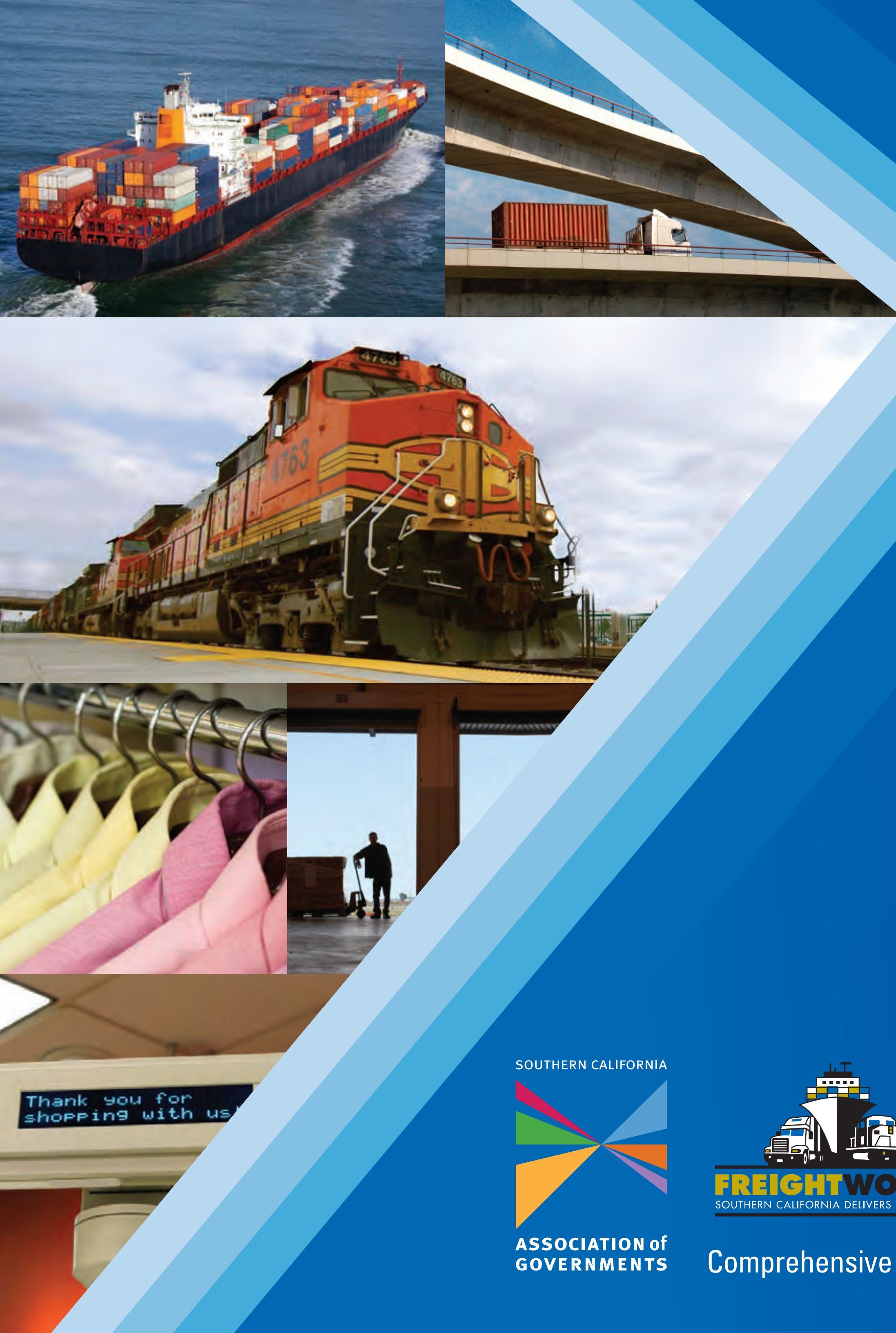


ON THE MOVE

SOUTHERN CALIFORNIA DELIVERS THE GOODS

SOUTHERN CALIFORNIA
ASSOCIATION of GOVERNMENTS

FREIGHTWORKS
SOUTHERN CALIFORNIA DELIVERS THE GOODS

Comprehensive Regional Goods Movement Plan and Implementation Strategy

ON THE MOVE

SOUTHERN CALIFORNIA DELIVERS THE GOODS

Comprehensive Regional Goods Movement Plan
and Implementation Strategy

final
report

prepared for

The Southern California Association of Governments

prepared by

Cambridge Systematics, Inc.

with

Arellano Associates

Diverse Strategies for Organizing, Inc.

Economics and Politics, Inc.

ICF International

Leachman and Associates

METRANS Transportation Center –
University of Southern California and
California State University at Long Beach

Public Financial Management, Inc.

URS Corporation

Wiltec, Inc.

February 2013

The preparation of this report was financed in part through grants from the United States Department of Transportation (U.S. DOT).

6 The Regional Goods Movement Plan

6.1 Introduction

As described in Chapter 4, the demand for goods movement in the SCAG region is expected to grow dramatically over the next 25 years. Without major investments in new projects, this growth will strain the existing capacity of the transportation system, resulting in increased delay to motorists and shippers, higher cargo delivery costs, more accidents, and elevated levels of air pollution. If not addressed, these problems could threaten the region's economic competitiveness and reduce the quality of life for its residents.

The Regional Goods Movement Plan represents a bold, comprehensive strategy for providing transportation system capacity that will protect the SCAG region's role as the U.S.'s primary gateway for international trade and foster continued growth in goods movement-dependent industries, while reducing congestion, emissions, and accidents. In this regard, the Plan represents a balanced approach that promotes economic growth and job creation while protecting the region's environment.

6.2 Summary of Strategies

The Goods Movement Plan is designed to meet regional goals and to address the key transportation challenges brought on by dramatic growth in demand for trucking and rail services. (Chapter 1 describes regional goals and Chapter 4 describes the challenges.)

Projects recommended in the Goods Movement Plan fall into several major categories:

Highway Strategies

- Regional Clean Freight Corridor System (Section 6.3).
- Zero and Near-Zero Emission Truck Transportation (Section 6.4).
- Truck Bottleneck Relief Projects (Section 6.5).
- San Pedro Bay and Hueneme Ports Access Highway Projects and Border Crossing Projects (Section 6.6).

Railroad Strategies

- Mainline Rail Capacity Enhancements (Section 6.7).
- On-Dock Rail Yard Enhancements and Port-Area Rail Infrastructure Improvements (Section 6.8).
- Near-Dock Rail Yard Enhancements (Section 6.9).
- Rail-Highway Grade Separations (Section 6.10).

For each strategy, Table 6.1 provides a brief description, lists benefits in terms of addressing regional goods movement challenges, and identifies the key analyses conducted and data sources that were used to evaluate the strategy. The primary challenges facing the goods movement system include transportation capacity, congestion and delay; cost of doing business; air quality; and safety.

In the remaining sections of this chapter, the following are described for each strategy:

1. Project Description;
2. Benefits;
3. Evaluation; and
4. Next Steps.

The *Evaluation* subsection describes the analysis performed as part of this study to evaluate options and to arrive at recommendations. However, some of the projects have been evaluated outside of this study process, such as the near-dock rail yard projects. Details on the evaluation of those projects are more appropriately found in environmental documents and studies performed by the project sponsors.

Table 6.1 SCAG Regional Goods Movement Strategies, Benefits, and Key Analyses Conducted and Data Used

Strategy	Description	Benefits	Key Analyses
Highway Strategies			
Regional Clean Freight Corridor System (RCFCS)	A series of truck only lanes (two in each direction) extending from the San Pedro Bay Ports via I-710, connecting to an East-West alignment that generally parallels SR 60, and continuing on to I-15 and I-10 in Ontario. East of I-710, the current preferred alignment runs adjacent to UPRR Los Angeles Subdivision from I-710 to I-605, elevated above the San Jose Creek from I-605 to SR 57, parallel to SR 60 from SR 57 to I-15, and then parallel to I-15 from SR 60 to I-10. (See related section below regarding Zero-Emission vehicles.)	Benefits of the I-710 component of the RCFCS include: • Reduced congestion on I-710; • Reduced potential for truck-auto accidents by separating trucks form automobiles; and • Reduced emissions. Benefits of the East-West Freight Corridor segment of the RCFCS include: • Truck delay reduction of 11% in the influence area;[a] • All traffic delay reduction of 4.3% in the influence area;[a] • Truck volume reduction of 82% on SR 60 (the route parallel to the corridor); • Reduced truck/automobile accidents (up to 20-30 per year in some segments); and • SR 60 parallel corridor serves local markets: it is within 5 miles of 50% of the region's warehousing square footage[a], and 27% of the region's total manufacturing employment. [a] Map of influence area is shown in Figure 6.8.	I-710 Corridor analyzed through DEIR/DEIS. For the EWFC, a multistep analysis of multiple potential corridor alignments was conducted. This included: • Right-of-Way assessment: Documented the land uses along each potential corridor alignment. Focused on impacts to sensitive land uses such as: residential areas, parks, schools, natural waterways. • Market assessment: Quantified the corridor's proximity to warehousing and manufacturing businesses (using GIS and InfoUSA). • Heavy-Duty Truck model: Nine model runs were completed with the SCAG HDT model. They allowed for the quantification of delay reduction and traffic benefits of the alternative alignments. • Safety assessment: Quantified truck-involved incidents along key highway corridors – using SWITRS (Statewide Integrated Traffic Records System).

Table 6.1 SCAG Regional Goods Movement Strategies, Benefits, and Key Analyses Conducted and Data Used (continued)

Strategy	Description	Benefits	Key Analyses
Highway Strategies			
Near-Zero and Zero-Emission Truck Transportation	The 2012 RTP introduces a four-phased action plan with key milestones to advance research, development, and deployment of new near-zero and zero-emission technologies. The four phases reach from 2012 to 2035, and include: • Phase 1: Project scoping and evaluation of existing work; • Phase 2: Evaluation, deployment, and prototype demonstrations; • Phase 3: Initial deployment and operational demonstration; and • Phase 4: Full-scale demonstrations and commercial deployment. A zero-emission truck system also is a critical feature of the Regional Clean Freight Corridor System.	A systems analysis was conducted to determine how a zero-emission truck system could work on the East-West Freight Corridor component of the Regional Clean Freight Corridor System and emissions reductions from this application were calculated: 100% zero-emission truck utilization removes: 4.7 tons of NO_x, 0.16 tons of $PM_{2.5}$, and 2,401 tons CO_2 daily.	A detailed systems analysis was conducted to determine the potential costs and benefits of a zero-emission freight corridor system. Prior to conducting the systems analysis, alternative zero-emission technologies were evaluated to determine potential applicability and readiness for the freight corridor. Analysis built on existing work to quantify the potential of zero-emission technologies to move cargo, as well as previously completed analysis of appropriate zero-emission truck technologies. This included work completed by partners such as the Ports of Los Angeles/Long Beach, CALSTART, and others. Quantified the impacts of the full conversion of truck fleet using the freight corridor to zero-emission vehicles (using EMFAC and emissions factors from the California ARB).

Table 6.1 SCAG Regional Goods Movement Strategies, Benefits, and Key Analyses Conducted and Data Used (continued)

Strategy	Description	Benefits	Key Analyses
Highway Strategies			
Truck Bottleneck Relief Projects	A coordinated truck bottleneck relief strategy, targeting the region's worst truck bottlenecks in a cost-effective manner. Includes a wide variety of projects that can address bottlenecks, including: • Auxiliary lanes; • Ramp metering; • Extension of merging lanes; • Ramp and interchange improvements; • Capacity enhancements; and • Maintenance/resurfacing projects.	Analysis revealed that the top 50 congested areas/bottlenecks contribute over one million hours of truck delay annually to SCAG roadways. Addressing these bottlenecks could yield substantial delay reduction, as well as associated emissions reduction and safety benefits.	Five-step bottleneck assessment included: • Defined key truck highways: Based on truck volumes and travel patterns. • Defined priority truck bottlenecks: Using INRIX, PeMS, and Caltrans AADT data. • Identified planned improvement projects: Gathered from RTP lists, stakeholder interaction, FTIP and CSMP project lists. • Compared priority bottlenecks to known/ identified project concepts. Overlaid map of bottlenecks with the project map, and determined which bottleneck projects are "top priority." • Developed new project concepts for several bottlenecks where no projects already are in the pipeline. Also examined potential lower cost strategies for certain high-priority bottlenecks that could provide interim improvements while larger projects await full funding.

Table 6.1 SCAG Regional Goods Movement Strategies, Benefits, and Key Analyses Conducted and Data Used (continued)

Strategy	Description	Benefits	Key Analyses
Highway Strategies			
San Pedro Bay and Hueneme Ports Access Projects and Border Crossing Projects	Several capital improvement projects designed to improve the landside access to the San Pedro Bay Ports and Port Hueneme. These projects are included in the RTP, including long-range improvement projects, as well as others that already are underway. They include: • Gerald Desmond Bridge replacement. • South Wilmington Grade Separation. • I-110/SR 47 Interchange and John S. Gibson Intersection/NB I-110 Ramp Access. • C Street/I-110 Access Ramp Improvements. • Hueneme Road widening between Ventura Road and Rice Avenue. • Calexico East Port of Entry Expansion	Reduces delay to autos and trucks in the vicinity of the ports. Projects also reduce emissions and accidents. Supports access to the San Pedro Bay Port complex, the largest deepwater port in the U.S., and to the Port of Hueneme, the only deepwater port between Los Angeles and the Bay Area. Reduces delays at U.S./Mexico border.	Identified through previous traffic and environmental studies and plans conducted by the ports.

Table 6.1 SCAG Regional Goods Movement Strategies, Benefits, and Key Analyses Conducted and Data Used (continued)

Strategy	Description	Benefits	Key Analyses
Railroad Strategies			
Mainline Capacity Enhancements	A coordinated set of main line capacity enhancements, driven by projected levels of train traffic along the UP and BNSF main lines. Specifically, projects will include: • Implementation of the "Modified status quo" routing for UP trains, where trains would use the Alhambra Subdivision between Pomona and Colton instead of the Los Angeles Subdivision from Pomona to W. Riverside and the BNSF San Bernardino Subdivision from W. Riverside to Colton. • Installing a second, third, or fourth main track on specific segments of UP and BNSF main lines. • Addition of crossovers, bridges, and culverts (support infrastructure). • Upgrading junctions to facilitate smoother transitions.	Reduction of projected 2035 regional train delay to year 2000 levels. Provision of sufficient main line capacity to handle projected 2035 demand. Maintenance of SCAG region's competitive position as U.S.'s principal gateway for international containerized cargo.	Recommendations are drawn from the 2011 Regional Mainline Rail Study, which included analysis such as: • Simulation of current and future freight and passenger rail activity (using a proprietary model owned by Dr. Leachman of Leachman and Associates, LLC). • Simulation of revised "Modified Status Quo" routing of UP trains. • Estimated costs for each project.
On-Dock Rail Yard Enhancements and Port Area Rail Infrastructure Improvements	Implementation of $2.5 billion of rail improvements that have been identified by the Ports of Los Angeles and Long Beach. The projects are designed to facilitate an increase in on-dock rail service, to reduce railroad delay and limit conflicts with highway traffic. Specifically, projects include: • On-dock rail support facilities; • Cerritos Channel Bridge; • Third track in several locations; • Grade separations in several locations; • Track realignment projects; and • Rail yard support/improvement projects.	Reduction in truck trips from the ports to downtown railyards, as well as associated congestion, emissions, and accidents.	Estimate portion of 2035 TEUs that would utilize on-dock dock facilities (demand estimation). Allocation of marine TEUs to on-dock rail yards. Estimate fraction of total intermodal lift demand that could be satisfied by new on-dock capacity relative to total lift capacity in the Southern California intermodal terminal system. Utilized work completed by the Ports of Los Angeles and Long Beach to document the need for and prioritization of internal improvement projects.

Table 6.1 SCAG Regional Goods Movement Strategies, Benefits, and Key Analyses Conducted and Data Used (continued)

Strategy	Description	Benefits	Key Analyses
Railroad Strategies (continued)			
Near-Dock Rail Yard Enhancements	A strategy to create additional lift capacity at near-dock rail facilities. This would result in improved rail accessibility to port operations, and would result in reduced truck VMT and associated emissions. Specifically, projects that comprise this strategy include: • Intermodal Container Transfer Facility (ICTF) modernization project. • Southern California International Gateway (SCIG): development of a new near-dock facility.	Reduction in truck trips from the ports to downtown railyards, as well as associated congestion, emissions, and accidents.	Estimate of portion of 2035 TEUs that would utilize near-dock and off-dock facilities (demand estimation). Allocation of marine TEUs to near-dock and off-dock rail yards and determination of new on-dock and near-dock capacity that would satisfy demand for all intermodal rail markets in the region. Analysis/research into the ICTF and SCIG projects, including information drawn from their environmental review processes.
Rail-Highway Grade Separations	Construction of grade separations at priority at-grade rail crossings throughout the SCAG region.	Elimination of 5,782 vehicle hours of delay per day at grade crossings by 2035. Elimination of 71 at-grade crossings (and associated safety concerns). Reduction of 22,789 pounds of CO_2, NO_x, and $PM_{2.5}$ emissions per day (from vehicles idling at crossings).	Estimate of vehicular delay at regional rail crossings (using train volumes by length and speed, and vehicle traffic counts and forecasts). Calculation of emissions reductions at each crossing (using vehicular delay data and emission rates for vehicles at idle). Determination of five-year average of accidents at the at-grade rail crossings.

6.3 The Regional Clean Freight Corridor System

6.3.1 Project Description

The Regional Clean Freight Corridor System (RCFCS) is a proposed series of truck-only lanes (two in each direction) extending from the San Pedro Bay Ports to I-15 and then north along I-15 to I-10 in the Inland Empire. It is composed of two major segments:

- I-710 Truck Corridor (see Figure 6.1) from the San Pedro Bay Ports to the rail yards near downtown Los Angeles. The estimated cost of the I-710 Corridor project (including mixed flow lanes and truck lanes) is $5.6 billion. A Draft Environmental Impact Report (DEIR) for the project was released in July 2012.
- East-West Freight Corridor (EWFC) from the northern terminus of the I-710 Truck Corridor to I-15 and then north along I-15 to I-10. Estimated cost for the project is $16.15 billion.

Figure 6.1 I-710 Freight Corridor

Figure 6.2 shows the entire freight corridor system with the preferred alignment of the EWFC. From I-710, the preferred EWFC alignment is adjacent to the Union Pacific Railroad Los Angeles Subdivision to I-605; then it would be elevated above the San Jose Creek Flood Control Channel to SR 57; then it would run parallel to SR 60 to I-15; and then it would run north along I-15 to I-10.

Figure 6.2 Freight Corridor System with the Preferred Alignment for East-West Freight Corridor

The RCFCS would consist of two truck-only lanes in each direction and would be separated from mixed flow lanes. Wherever possible, the truck-only lanes would be constructed at-grade (to reduce construction costs) although there will be major elevated segments (e.g., over the San Jose Creek) in order to avoid right-of-way constraints.

The RCFCS will feature zero or near-zero local emissions operations and will provide a platform for the introduction of new zero-emission truck technologies. (See more detailed description of this aspect of the corridor in the Section 6.4.)

The purpose of the RCFCS is to increase roadway capacity for trucks along heavily traveled corridors, and to reduce congestion, accidents, and emissions. As demonstrated in Chapter 3, there are major concentrations of manufacturing, warehouse, and logistics facilities along I-710, many of the major east-west freeway corridors into the Inland Empire and along parts of I-15 close to San Bernardino. The highest concentration of these activities is along a corridor within five miles of SR 60. Chapter 4 also shows that I-710, all of the East-West Corridor options, and I-15 have high levels of truck traffic currently, and are expected to experience high levels of growth. In addition, several of these corridors have among the highest levels of truck-involved accidents of any corridors in the region and the State. Separating truck and auto traffic to the maximum extent possible through the development of a freight corridor system should have significant safety benefits for the region.

The idea of a system of truck lanes serving Southern California's major truck corridors has been discussed regionally for more than 15 years. Feasibility studies and major corridor studies that have evaluated truck-only lane options have been conducted over that period of time for SR 60, I-710, and I-15 and some version of the truck lane system has appeared in several regional transportation plans. In 2008, LA Metro in partnership with a number of regional stakeholder agencies initiated an EIR/EIS for the I-710 portion of the Freight Corridor system. The draft EIR/EIS was released for public comment in July 2012.

When the Comprehensive Regional Goods Movement Plan and Implementation Strategy was initiated there were three main technical questions that needed to be addressed in order to advance the freight corridor strategy:

- Does a freight corridor system still appear to provide sufficient benefits in light of the most pressing goods movement needs of the region?
- Where should the alignment be for the East-West segment of the system? At the conclusion of the Multi-County Goods Movement Action Plan and the development of the 2008 RTP, there was no regional consensus on where the most appropriate alignment should be.
- How should clean technologies be included in the plan for the freight corridor system? There were vague ideas of a corridor that would encourage the use of clean truck technologies and the 2012 RTP envisioned these as being alternative fuel trucks. There also was a proposal in the 2008 RTP to build a high-speed container transport system (at the time, a Maglev system was envisioned) that would very likely be built in a similar corridor as the freight corridor system. The high-speed container transport system would be electrified in some way and would thus be a zero local emission system.

The work of the Comprehensive Regional Goods Movement Plan and Implementation Strategy focused on analysis and further development of the East-West segment of the freight corridor system and the zero or near-zero emission characteristics. The following critical conclusions have been reached that will advance the Regional Clean Freight Corridor System:

- A Freight Corridor System is still an important and much needed strategy to meet goods movement needs in the region. The analysis showed the potential to serve major goods movement markets that are critical to the region. It also showed that a freight corridor would experience high levels of use if built in any of the potential East-West corridors. The freight corridor system would substantially reduce truck delay in a large area of influence within the region, would also reduce general congestion and have positive impacts on parallel freeways and arterials, and would eliminate a significant number of truck-auto crashes.
- The best candidate alignments for an EWFC segment would be in the SR 60 corridor. This corridor would provide high levels of truck usage comparable to or exceeding those that would be achieved in other potential corridors and would achieve the highest levels of overall delay reduction for trucks and autos of any candidate corridors. It would effectively serve international trade markets, interregional markets for the region's manufacturers and national/regional distribution centers, as well as local markets for the region's manufacturers, retailers, and other local businesses. In fact, the highest share of the region's warehouse and manufacturing space is within a five-mile corridor centered along SR 60. It would alleviate several hot spots that have high levels of truck delay and truck-involved crashes. In addition, there are several possibilities for non-freeway alignment segments that could provide improved access to industrial areas and reduce the potential for residential property takings.
- The RCFCS also represents an opportunity to promote zero-emission technology and there are several technology options that can be incorporated directly into the freight corridor infrastructure. This approach to a Clean Freight Corridor System is more effective than one with two parallel systems – a freight corridor and a high-speed container transport system. Two parallel systems would compete for the same markets and would be more costly than a freight corridor system that incorporates both objectives – a dedicated freight movement corridor with zero-emission features. The technologies that are emerging for electrifying trucks would allow the system to retain many of the flexible features of the current truck/highway mode of goods movement. Locating the EWFC within the SR 60 corridor would provide access to a significant concentration of origins-destinations for goods movement that are within five miles of SR 60, an advantage given potential range limitations of zero-emission trucks.

6.3.2 Benefits

The benefits of the I-710 Truck Corridor (the initial component of the RCFCS) are described in the I-710 DEIR/DEIS. Readers are encouraged to review that document.

Key benefits of the EWFC segment are listed in Table 6.2.

Table 6.2 Benefits of the EWFC

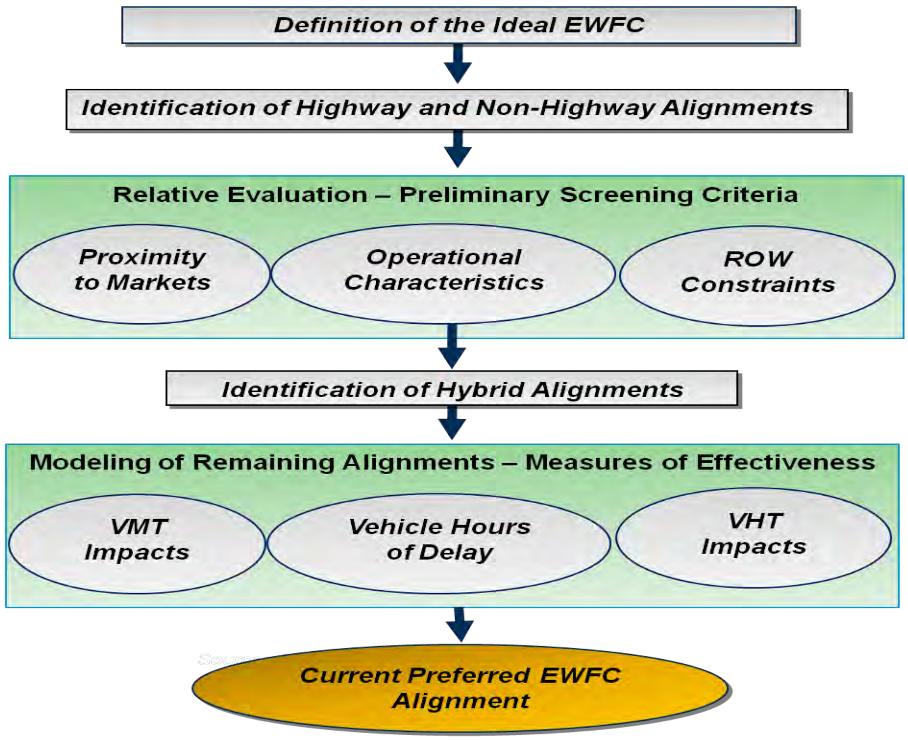
Category of Benefit	Estimated Impact of the EWFC
Mobility	• Truck delay reduction of approximately 11%. • All traffic delay reduction of approximately 4.3%. • Reduces truck volumes on general purpose lanes – 42-82% reduction on SR 60.
Safety	• Reduced truck/automobile accidents (up to 20-30 per year on some segments).
Environment	• 100% zero-emission truck utilization removes 4.7 tons on NO_x, 0.16 tons of $PM_{2.5}$, and 2,401 tons of CO_2 daily.
Community	• Preferred alignment has least impact on communities. • Reduces traffic on other freeways. • Zero-emission technology (ZET) – reduces localized health impacts.
Economic	• Supports mobility for goods movement industries, which comprise 34% of SCAG regional economy and jobs.

6.3.3 Evaluation

The approach to evaluating alternative alignments for the EWFC is illustrated in Figure 6.3. Some alignments were either eliminated or modified through successive screening and analysis to narrow the range of options that were subjected to the more detailed travel demand modeling for mobility benefits.

The ideal EWFC would provide significant mobility, emissions reduction, and safety benefits while minimizing costs and right-of-way impacts. Non-freeway alignments (e.g., rail lines and electric power transmission corridors) were evaluated as well as freeway corridors. Preliminary screening of options involved assessing proximity to warehousing and manufacturing facilities, operational characteristics (e.g., grades) and ROW impacts. This led to the identification of several hybrid alternatives. Measures of Effectiveness (MOE) were then evaluated for the hybrid alternatives, including vehicle miles of travel (VMT), vehicle hours of delay (VHD) and vehicle hours of travel (VHT).

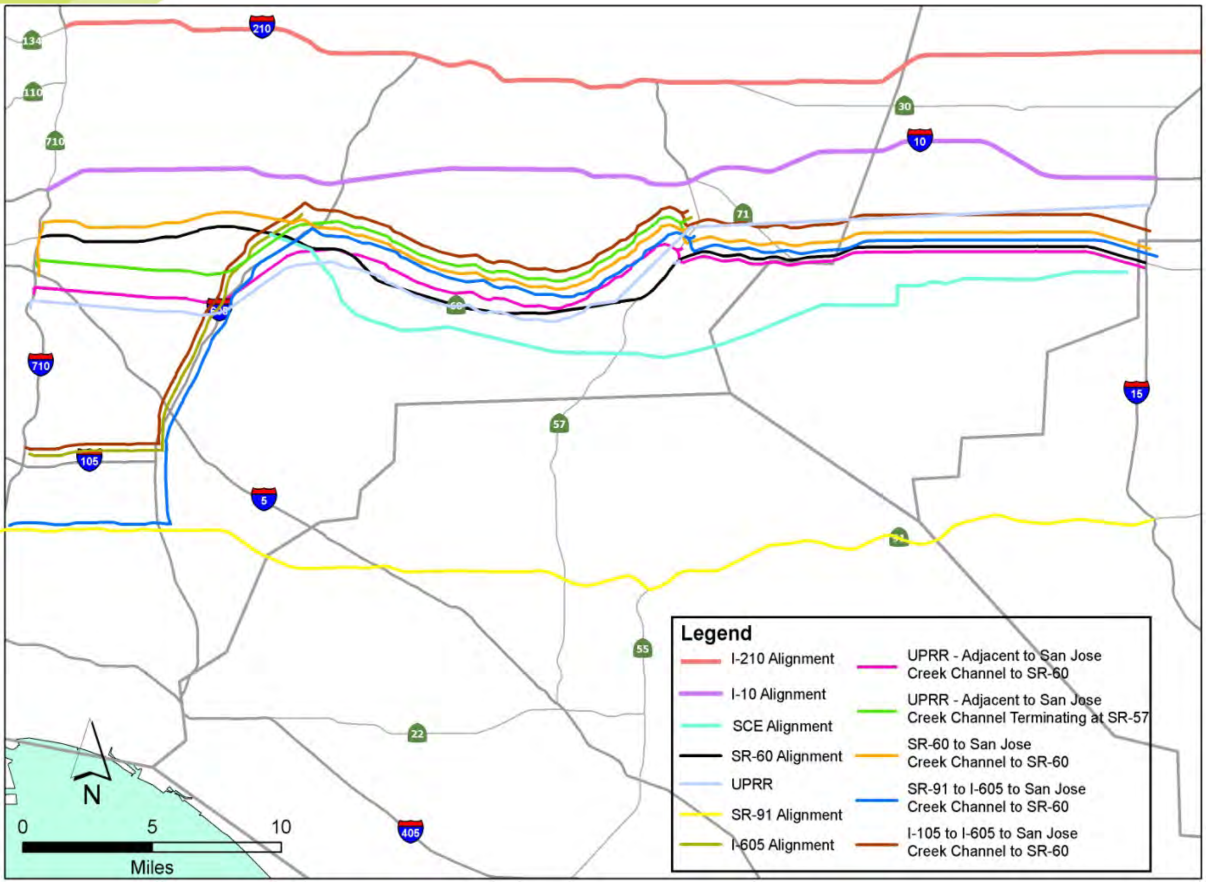
Figure 6.3 Methodology to Select an EWFC Recommended Alignment



Substantial analysis of the EWFC and various alignment options was conducted as part of the study. The approach was to start with an overall assessment of the freight transportation needs in the candidate East-West corridor, including an analysis of current and projected volumes of truck traffic, current and projected levels of overall congestion in these corridors, and safety concerns. Much of this information was presented in Chapter 4. This established the need for a Freight Corridor System. Detailed data on the benefits and performance of alternative alignments were evaluated as well. Conceptual engineering was used to evaluate localized right-of-way constraints.

Potential Alignments – The alternative alignments considered in the study are shown in Figure 6.4.

Figure 6.4 Initial Candidate East-West Freight Corridor Alignments



Of these alignments, three were non-freeway alignments:

- UPRR-Adjacent Alignment – The advantage of the UPRR-adjacent alignment is that by following the railroad ROW, the alignment is close to industrial users and away from residential properties (more on this is presented in the discussion of proximity to markets and ROW constraints). The UPRR representatives have indicated that the alignment would need to be outside of railroad ROW because there is insufficient space within their existing ROW. The UP also expressed concerns about safety with a freeway immediately adjacent to railroad tracks. The consultant team examined this ROW for its full extent between I-710 and I-15 and determined that the amount and cost of industrial property takings that would be required would likely make this infeasible as the sole alignment. Instead it was determined that it might be suitable to use a portion of this alignment as a connection between I-710 and the primary alignment somewhere in the vicinity of the connection between I-605 and SR 60. The exact location of this portion of the alignment and how it would combine with other alignment segments is described in more detail in the discussion of the analysis of ROW impacts.
- San Jose Creek Alignment – The San Jose Creek is a flood control channel maintained by the U.S. Army Corps of Engineers and the Los Angeles County Department of Public Works. Portions are soft-bottomed creek but much of the channel is concrete and runs through industrial areas within the City of Industry. This alternative was identified in discussions with the City of Industry after initial ROW constraints analysis was conducted. In discussions with Los Angeles County Department of Public Works (LACDPW) it was learned that there may be a need to expand the channel and there also are portions of the concrete segments that are in need of improvement/ reconstruction. It may be possible to make these improvements to the flood control channel in a manner that is consistent with the development of a Freight Corridor elevated above the channel. There may be other ROW constraints/issues associated with this alignment that are discussed later in this section.

- **Southern California Edison Transmission Corridor –** SCE owns a transmission corridor that runs east-west roughly parallel to SR 60 and SR 91. There is very little developed property along segments of this ROW, suggesting that it might be compatible with a Freight Corridor alignment. However, the ROW runs through very mountainous terrain and examination of the grades throughout this ROW suggest that it would not be suitable for development as a Freight Corridor.

Proximity to Markets – Much of the discussion and rationale provided for the Freight Corridor System provided in the Multi-County Goods Movement Action Plan and the 2008 RTP focused on the need to serve port truck traffic. However, a major finding of the Regional Comprehensive Goods Movement Plan and Implementation Strategy was that while port activity and international trade are important to the region, it represents a relatively small (but fast-growing) component of regional truck traffic. In order for the RCFCS to provide economic benefits to the region while addressing general mobility, safety, air quality, and livability issues, it needed to be located close to major goods movement markets, such as manufacturing and warehouse facilities. This became a major criterion for determining the benefits of the EWFC for particular alignments.

Proximity to Warehousing and Manufacturing – As noted in Chapter 2, the region supports a significant logistics industry that includes not only port-related warehousing but national and regional distribution centers for domestic distribution. The region also is one of the leading manufacturing centers in the country. Proximity to these markets would improve access and maintain attractiveness of the region for these activities. The SR 60 alignment is an excellent choice based on its proximity to these key markets. Figure 6.5 shows the clustering of occupied and available warehouses within five miles of SR 60, as well as the locations of undeveloped land that could be used for warehousing. As shown in Table 6.3, 50 percent of the warehousing square footage in the region is within five miles of SR 60.

Figure 6.5 Warehouse Square Footage along SR 60
Five-Mile Buffer

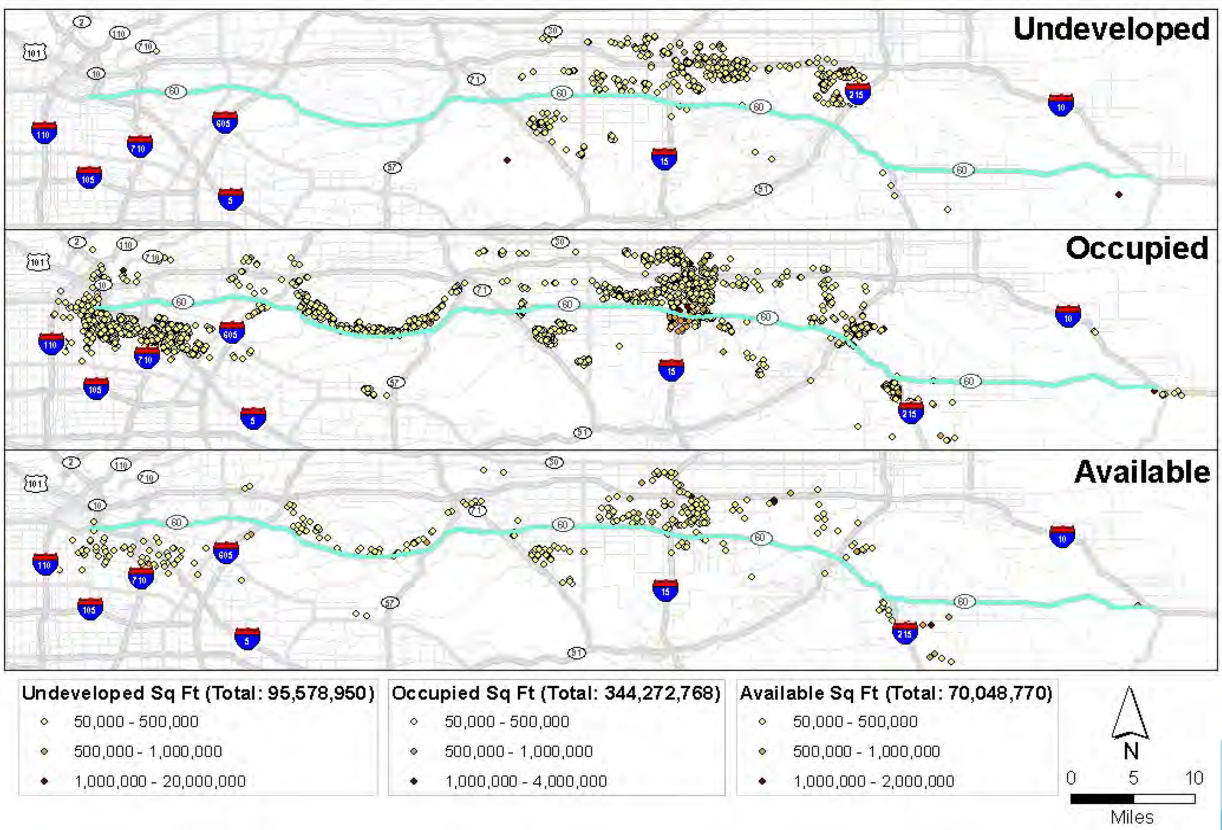


Table 6.3 Warehouse Square Footage and Manufacturing Employment Characteristics of the Potential East-West Freight Corridors
Projected Warehousing Space and Current Manufacturing Employment

	Warehousing		Manufacturing	
East-West Highway/ Alignments	Total Warehouse Square Feet (Millions, within Five Miles)	Percent of Regional Total Warehousing	Manufacturing Employees (In Thousands)	Percent of Regional Jobs
UPRR Line	533.4	52%	238	28%
SR 60	509.9	50%	227	27%
I-10	442.9	43%	156	19%
SR 91	188.9	18%	166	20%
I-210	171.2	17%	60.9	7%
SCE	291.5	29%	N/A	N/A

Right-of-Way (ROW) Constraints – While a detailed ROW constraints and impact analysis will need to be conducted as part of any future corridor feasibility study or EIR/EIS, a planning-level ROW constraints analysis was conducted in order to determine potential impacts of the EWFC and to refine alignment concepts. The objective was to identify alignments with the potential to minimize the need for residential property takings in order to construct the project. The planning-level ROW analysis was conducted for the following alignment alternatives.

- I-10;
- SR 60;
- UPRR-adjacent;
- SR 91;
- San Jose Creek; and
- Two hybrid alternatives that connected I-710 and SR 60: 1) SR 91 to I-605 to SR 60 and 2) I-105 to I-605 to SR 60.

The approach was to develop three generic conceptual cross-sections:

1. At-grade to the outside of the any existing freeway,
2. Elevated to the outside of any existing freeway, and
3. Elevated in the median of any existing freeway.

A footprint was developed for each of these cross-sections that determined the necessary ROW width and general location of the ROW relative to existing freeway alignments. The SR 60 Truck Lane Feasibility Study was used to determine the cross-section characteristics for different segments of SR 60 and the same logic was then applied to the other corridors based on the general configuration and constraints of the ROW in order to determine an appropriate cross-section for each segment of the alignment. This allowed for "apples-to-apples" comparisons of potential ROW impacts. It is important to note that this approach does not guarantee that the actual footprint of a Freight Corridor could not be developed with less impact than that suggested by this analysis just as it is possible that ROW impacts could be greater than projected here (particularly at interchange or ramp locations). However, the approach does provide a method of comparing alternatives. Once the footprint was determined for each segment of the alignment, GoogleEarth aerial maps were used to overlay the footprint on the alignment and determine if the alignment could be accommodated within existing public ROW or if it would require partial or complete takings of residential or industrial properties.

The analysis revealed several significant features of the alignment options that led to the development of a hybrid alignment capturing some of the best features of the available ROW.

- All of the alignment options require property takings, including residential property takings. Of all the freeway alignments, SR 60 had the least amount of residential property takings and the greatest opportunity to stay within the existing ROW.
- The UPRR-adjacent alignment would require minimal residential property takings but would require substantial industrial property takings along its entire extent.
- The San Jose Creek alignment could be accommodated with the least impact on residential property and without the need for as much expensive property acquisition as would the UPRR-adjacent alignment. There are potentially sensitive recreational land uses at the west end of this alignment that will likely require further investigation. Connections to the I-710 Freight Corridor and to SR 60 east of SR 57 would need to be developed and these also have potential impacts on neighborhoods close to the alignment that require further engineering investigation.

The ROW constraints analysis concluded that the most effective approach to developing an EWFC from a ROW perspective would be to develop a hybrid alignment that included the San Jose Creek as a central feature. Looking at the potential options for connecting to the San Jose Creek alignment in the east and in the west, the best options appear to be a connection along the UPRR-adjacent alignment in the west (which would minimize residential property impacts while reducing the amount of industrial property that would need to be acquired) and either connecting to SR 60 somewhere in the vicinity of SR 57 (in or around the City of Diamond Bar) or ending the Freight Corridor at SR 57.

The City of Industry conducted an engineering feasibility study of the San Jose Creek alignment and came up with a conceptual engineering plan for an elevated structure that would meet the geometric requirements of a freeway and would ensure the hydraulic integrity of the flood control channel. This is the basis for the cost and financial analysis provided in Chapter 8. The consultant team examined several options for engineering the UPRR alignment and the connection at SR 57. Clearly, further engineering and environmental work is needed to refine the design and alignment concepts and to ensure that property impacts are kept to a minimum, but the ROW analysis suggests that there are potential alignments within the SR 60 corridor for which this can be done.

Potential Users of the East-West Freight Corridor – The SCAG Heavy Duty Truck (HDT) model was used to analyze which markets would be served by the EWFC. This analysis was conducted at three representative locations along the preferred corridor alignment, as shown Figure 6.6.

Most of the trucks that would use the exclusive truck lanes would be heavy trucks. Trucks remaining on the general purpose lanes would be primarily those serving local service and distribution markets and would be the smaller trucks. Figure 6.6 also shows the percentage of trucks that consist of port, interregional, and manufacturing trips. The chart shows that port trucks constitute a larger share of the traffic at the west end of the EWFC than at the east end.

Evaluating Mobility Benefits – Mobility benefits were evaluated for five hybrid alignments along with a sixth alignment consisting of SR 91 from I-710 to I-15.

Figure 6.6 Potential Users of the East-West Freight Corridor

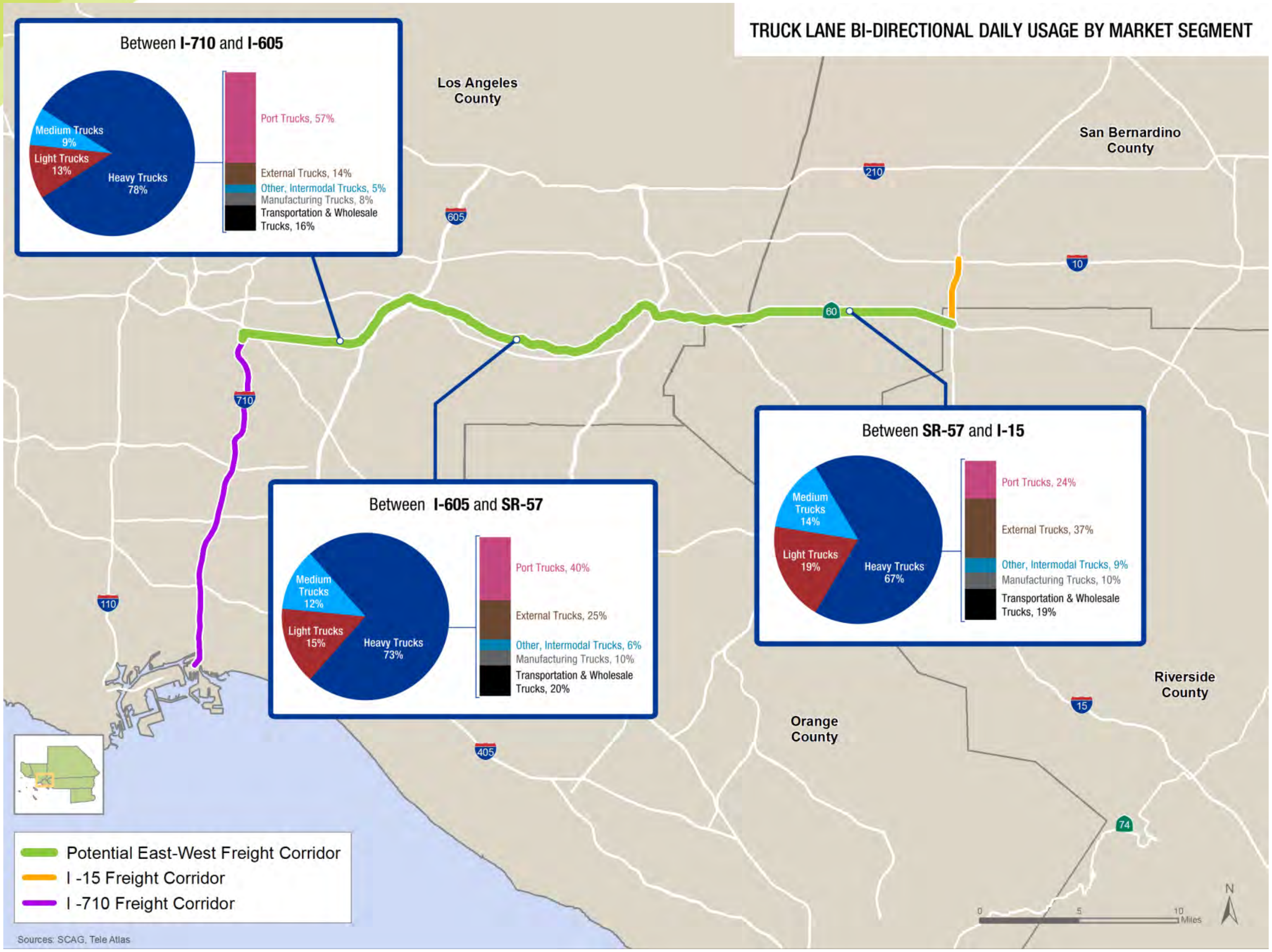


Table 6.4 compares several Measures of Effectiveness (MOE) for six alternative corridors. This table numbers the six alternative corridors and these numbers are used to refer to the alternatives in the discussion that follows.

MOE 1 – 2035 Truck Volumes

The number of trucks attracted to the EWFC is a key indicator of the system's performance.

- All of the alternatives are forecast to carry high volumes of truck traffic. Alternatives 1, 3, and 5 are each forecast to carry the highest truck volumes – higher than any of the adjacent freeways would carry in the absence of truck lanes. Imaginary lines, referred to as screenlines, were drawn to intersect each of the six alternative corridors. The locations of these screenlines are shown in Figure 6.7. Daily truck volumes range from about 55,000 to 76,800 at Screenline 1, from 51,500 to 57,800 at Screenline 2 and from 47,900 to 60,400 at Screenline 3. Alt. 1 (UPRR/San Jose Creek/SR 60 [long]) generally carries the second- or third-highest daily truck volumes at all three screenlines (58,000 at Screenline 1; 55,300 at Screenline 2; and 60,400 at Screenline 3).

The amount of truck traffic on the EWFC would exceed that of any parallel corridor if the freight corridor were not built. This indicates a high level of demand that can be captured by any of the alignments.

Delay Benefits – In order conduct an analysis of delay benefits, an *area of influence* that picked up the impacts on all of the potential East-West corridors was identified. The influence area was intentionally developed to be very large in order to include all of the alignments that were evaluated and most of the trips that traverse the central core of the region. The consequence is that even small changes (on the order of a few percentage points) in any of the key mobility indicators would suggest a relatively large impact. This is shown in the map in Figure 6.8. The UP/San Jose Creek/60 alignment (Alternative 1) provides the greatest benefit to all highway users with a projected delay reduction of -4.3 percent. As noted, over this large an area, this is a significant delay reduction.

MOE 2 – Impacts on Delay – All Traffic

- The best performing alternative (Alt 1) shows a -4.3 percent reduction in delay for all traffic. Alternative 2 results in a 1 percent increase in delay for all traffic in the study area.

MOE 3 – Impacts on Delay – Heavy-Heavy Truck Traffic

- Alternative 1 performs well with a reduction in Heavy-Heavy truck delay of -10 percent.

MOE 4 – Impacts on Parallel Corridors

- All of the SR 60 corridors perform better on this MOE than does SR 91. In the case of the UP/San Jose Creek/60 alignment there is significant diversion from SR 60 (as much as 82 percent reduction in SR 60 truck volumes) and I-10 (as much as 39 percent reduction in I-10 truck volumes) and also some small diversion from I-210 (as much as 17 percent reduction in I-210 truck volumes) and SR 91 (as much as 19 percent reduction in SR 91 truck volumes). The SR 60 alignments also reduce truck volumes on parallel arterials by roughly 20 percent. While the SR 91 alignment would reduce truck volumes on SR 91 general purpose lanes by as much as 80 percent it would have little impact on SR 60 (22 percent – 24 percent reduction), I-10 (10 percent – 14 percent reduction), or I-210 (3 percent – 9 percent reduction).

Table 6.4 Measures of Effectiveness Comparison of Alternative EWFC Alignments

ID	East-West Corridor[a, b]	Truck Volumes	Delay (All Traffic)	Delay (HH Truck Traffic)	Impact on Parallel Routes	Summary/Key Points
1	UPRR – Adjacent to San Jose Creek Channel to SR 60	●	●	●	●	Carries the second highest truck volumes – within 5% of Alt. 5. Reduces truck traffic on SR 60 by 65-85%. Shows greatest reduction in total delay for all traffic (-4.3%) in influence area, as well as high reduction (-10%) for heavy-heavy truck delay.
2	UPRR – Adjacent to San Jose Creek Channel Terminating at SR 57	◐	◐	◐	○	Results in negative traffic impacts – 18% more traffic on SR 60 east of SR 57. Shows increase in total delay for all traffic (1%) in influence area, as well as medium reduction (-7%) for heavy-heavy truck delay.
3	SR 60 to San Jose Creek Channel to SR 60	●	●	●	●	Carries the same truck volumes as Alt. 1 – within 5% of Alt. 5. Reduces truck traffic on SR 60 by 70-85%. Shows high reduction in total delay for all traffic (-3.7%) in influence area, as well as high reduction (-9%) for heavy-heavy truck delay.
4a	SR 91 to I-605 to San Jose Creek Channel to SR 60	◐	◐	●	●	Carries lower truck volumes than Alt. 1, 3, 4b and 5. Shows greatest heavy-heavy truck delay reduction (-10.9%), but fairly low (-1.3%) overall total delay for all traffic.
4b	I-105 to I-605 to San Jose Creek Channel to SR 60	●	◐	●	●	Shows high heavy-heavy truck delay reduction (-10.7%), but fairly low (-1%) total delay for all traffic.
5	SR 91	●	◐	●	◐	Carries the most trucks at all screenlines – up to 57,780 (two-way volumes). Has little impact on parallel freeway east of SR 57. Shows high heavy-heavy truck delay reduction (-10.5%), but fairly low (-1%) total delay for all traffic.

[a] Corridors are listed geographically from North to South.

[b] Unless otherwise noted, every alignment connects to I-15.

Key: Whole Circle= High Rating, Half Filled-In Circle = Medium Rating, and Non-Shaded Circle= Low Rating.

Figure 6.7 Screenlines Defined for the EWFC Analysis

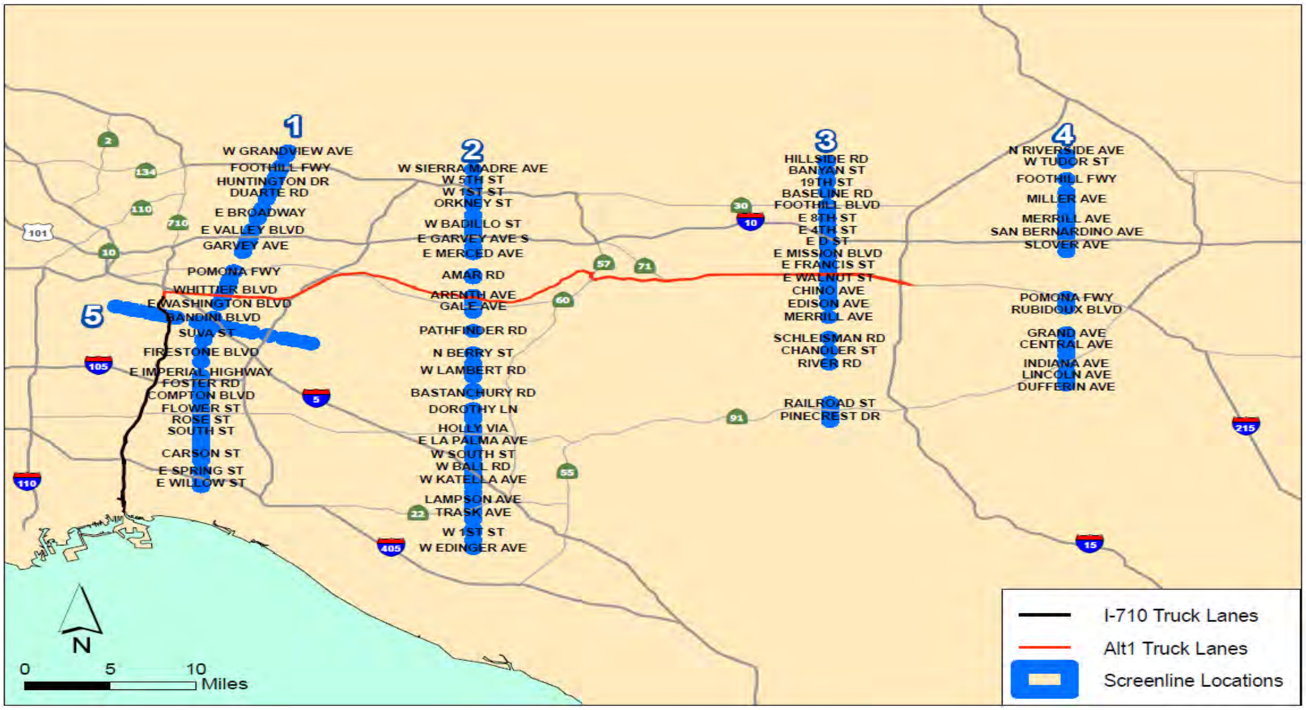
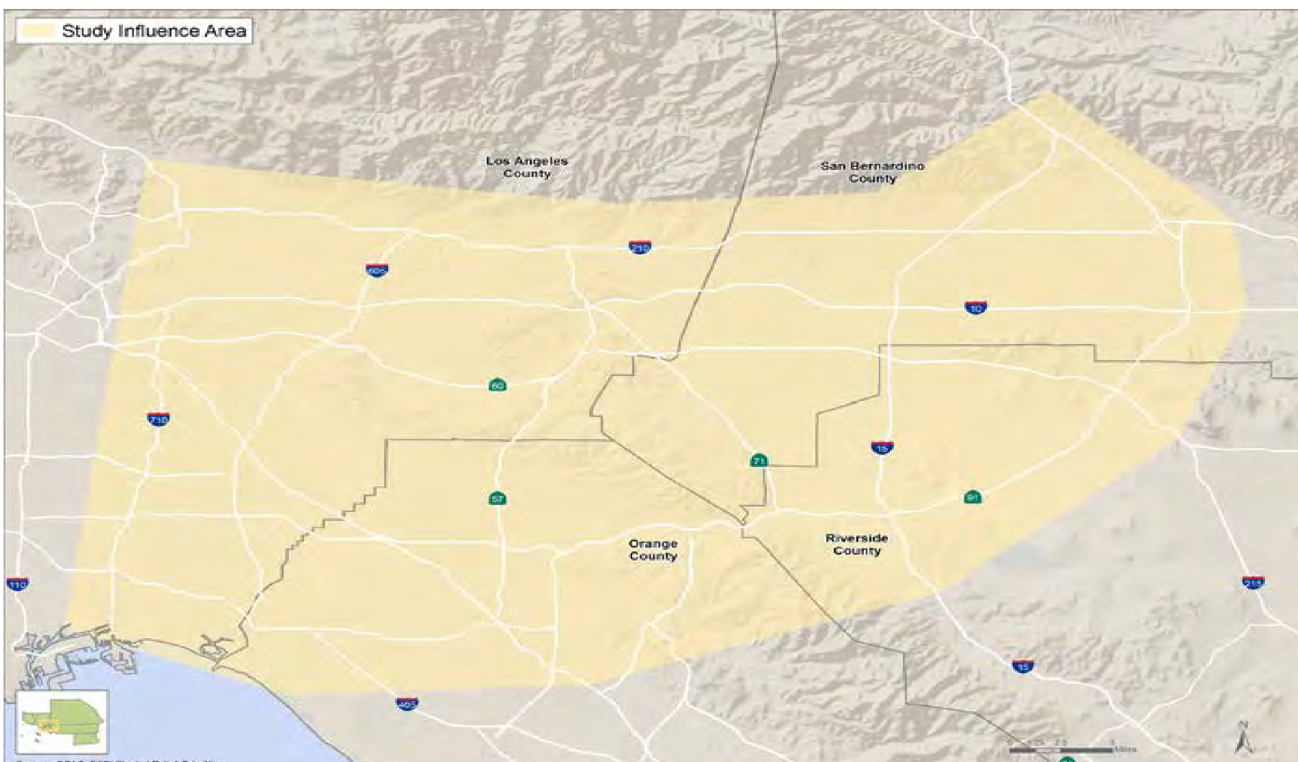


Figure 6.8 The EWFC Analysis Influence Area



6.3.4 Summary of Alignment Evaluation

While each of the alternative alignments that were evaluated in the Regional Comprehensive Goods Movement Plan and Implementation Strategy have their strengths and weaknesses, the SR 60 alignments, and in particular the UPRR-adjacent/ San Jose Creek/SR 60 alignment provides the highest overall performance. It meets all of the major objectives established for a freight corridor and would bring significant benefits to users and non-users alike. It provides the best access to key goods movement markets, it would require the least residential property takings, and it would offer significant mobility benefits (high truck usage, high truck mobility benefits, high overall mobility benefits, diversion of large numbers of trucks from parallel facilities). It would improve safety by separating trucks and autos in a corridor with some of the highest crash rates for trucks with autos of any corridor in the region. And in a zero-emission configuration (see Section 6.4), it would provide large reductions in diesel emissions.

6.3.5 Next Steps

The I-710 Corridor Improvement Project currently is undergoing environmental review. A draft EIR/EIS was released for public review in July 2012. LA Metro plans to revise and recirculate the DEIR/DEIS in the spring of 2013.

The EWFC will require more detailed engineering and a DEIR/DEIS. To date, a lead agency for this project has not been identified. It is recommended that LA Metro and SANBAG collaborate on the institutional arrangements for future study and ultimate implementation. Suggestions for alternative institutional arrangements are presented in Chapter 9. There also is additional engineering feasibility work needed for certain portions of the preferred alignment and some of this work could proceed prior to the initiation of a DEIR/DEIS. This is described further in Chapter 9.

6.4 Zero and Near-Zero Emission Truck Transportation[1]

A key element of the Regional Comprehensive Goods Movement Plan and Implementation Strategy is to develop, to the extent possible, a zero or near-zero emission goods movement system using advanced technologies. This will advance the vision of "green" goods movement adopted by regional stakeholders.

The region faces a major challenge as it tries to meet future National Ambient Air Quality Standards for ozone and $PM_{2.5}$ and the inability to meet these standards could lead to serious regulatory sanctions and loss of critical transportation funding in addition to harmful health effects. Developing a strategy that actively promotes zero-emission goods movement will allow the region to advance the rest of its goods movement vision and realize the economic benefits of a growing and efficient goods movement system.

Linking zero-emission technologies to the regional freight corridor system allows this system to act as a platform for the introduction of electrified trucks that could eventually be adopted throughout the region. There already are advanced technologies that have near to midterm potential and building elements of the zero-emission strategy into the freight corridor system plan sends a message to manufacturers and trucking fleets that the region is taking steps to help build demand for new technologies as they move closer to market readiness.

6.4.1 Project Description

The I-710 Freight Corridor would likely be the first application of a zero-emission truck technology on a corridor level. Beyond the I-710, zero-emission technology also has been proposed for the EWFC. Although a decision on the specific zero-emission technology has not been made, discussion about promising technology options are provided later in this chapter.

6.4.2 Benefits

For the South Coast Air Basin, implementing a zero-emissions truck technology on the EWFC would result in estimated percentage reductions in NO_x, $PM_{2.5}$, and CO_2 of 5.4 percent, 4.8 percent, and 3.4 percent, respectively, in 2035. Table 6.5 shows the emission reductions in five-year increments for the years 2020, 2025, 2030, and 2035. The table does not include the effects of implementing zero-emissions trucks on the I-710 corridor.

Since all of the electric/battery truck options are assumed to achieve zero local emissions, the emissions benefits of each technology option considered in this report would be the same.

---

1 As part of the Comprehensive Regional Goods Movement Plan and Implementation Strategy, the consultant team also conducted an evaluation of rail electrification options for Southern California. The conclusions of that evaluation suggest that freight rail electrification systems would need further development before they would be feasible. In addition, electrification of the system in Southern California would not be as operationally feasible as would electrification of a longer distance intercity rail corridor. The zero-emission research, development, and demonstration program recommended as a strategy in the Comprehensive Regional Goods Movement Plan and Implementation Strategy calls for continued study and development of zero or near-zero emission technologies for rail. The complete analysis of rail electrification can be found in the appendices to this report, *Task 8: Analysis of Freight Rail Electrification in the SCAG Region, Final Technical Memorandum*, Cambridge Systematics, Inc. January 2012.

Table 6.5 2025-2035 Vehicle Emissions Reduction in SCAB as a Result of the EWFC
Assumes 100 Percent Clean Trucks (Tons per Day)

	2020				2025				2030				2035			
	Daily Total VMT of Electric/ Battery Trucks	Daily Emissions Reduction			Daily Total VMT of Electric/ Battery Trucks	Daily Emissions Reduction			Daily Total VMT of Electric/ Battery Trucks	Daily Emissions Reduction			Daily Total VMT of Electric/ Battery Trucks	Daily Emissions Reduction		
		NO_x	$PM_{2.5}$	CO_2		NO_x	$PM_{2.5}$	CO_2		NO_x	$PM_{2.5}$	CO_2		NO_x	$PM_{2.5}$	CO_2
Light Heavy-Duty Trucks (LHD)	346,577	0.1	0.003	100	373,812	0.1	0.003	108	401,047	0.1	0.004	116	428,282	0.1	0.004	141
Medium Heavy-Duty Trucks (MHD)	195,611	0.2	0.016	157	210,983	0.2	0.018	169	226,354	0.2	0.019	183	241,726	0.2	0.020	217
Heavy Heavy-Duty Trucks (HHD)	1,404,496	3.6	0.111	1,482	1,514,866	3.8	0.120	1,599	1,625,236	4.1	0.130	1,724	1,735,606	4.4	0.138	2,043
Total	1,946,684	3.8	0.131	1,739	2,099,661	4.1	0.141	1,876	2,252,637	4.5	0.152	2,023	2,405,614	4.7	0.162	2,401
Percent of 2035 SCAB HDV Total														5.4%	4.8%	3.8%

Source: *EMFAC 2007, modified for recession effects and ARB Truck and Bus Rule; 2035 VMT numbers derived from preliminary version of the 2012 update to the SCAG Regional Transportation Plan (RTP) model; 2025-2035 Annual VMT Growth from MCGMAP used to derive interim year values.*

Notes: *Does not include emissions benefits as a result of I-710 truck lanes. This is an important consideration, since cost estimates include infrastructure, truck, and O/M costs, including I-710. The emissions estimates are based on South Coast Air Quality Management District standards for heavy-duty trucks (33,000 pounds to 60,000 pounds). Emission calculations are based on the most conservative (highest) scenario. Emissions Factors from 2007 (EMFAC) model, South Coast Air Quality Management District, Heavy-Heavy-Duty On-Road Vehicles (Scenario Years 2007 to 2026).*

6.4.3 Evaluation

Prior Studies of Zero-Emission Goods Movement Studies

Over the last few years there has been a significant evolution in thinking about the functional requirements for a zero-emission freight system. SCAG's 2008 RTP incorporated a zero-emission goods movement strategy involving a High-Speed Regional Transport (HSRT) system based on high performance and environmentally sensitive alternatives. Previous concepts focused on a fixed-guideway system, utilizing magnetic levitation technology that would link the San Pedro Bay Ports with an inland port facility. This system was envisioned as being distinct from the Freight Corridor system, which was identified in the 2008 RTP as a "Clean Truck Corridor."

A Request for Concepts/Solutions (RFCS) was issued in June 2009 by The Port of Long Beach, in conjunction with the Port of Los Angeles and the Alameda Corridor Transportation Authority (ACTA), to solicit interest from industry in provision of a Zero-Emission Container Movement System (ZECMS) to transport containerized cargo between the Ports and near-dock intermodal facilities. Development, delivery, and operation via public-private partnership, at no cost to the Ports or ACTA, were essential to the project.

The Port of Long Beach entered into an agreement with the University of Southern California, Keston Institute for Public Finance and Infrastructure to assemble an independent panel of experts to review and comment on submissions received in response to the RFCS.

Major findings and conclusions from the Keston Report are summarized below:

1. The concept of a ZECMS was identified as being well within the realm of technological feasibility, and that potentially viable technologies either already exist or could be available within a relatively short timeframe.
2. None of the proposed technology/systems met the minimum requirement of technological readiness with an equivalent to having an actual system completed with any similarity to that proposed in the ZECMS.
3. The hybrid diesel truck had achieved actual system completion through test and demonstration.
4. A ZECMS would have difficulty competing economically with conventional truck drayage, in light of the rapid advances being made in hybrid electric vehicles and an inherent flexibility and scalability.
5. The panel recommended that the San Pedro Bay ports and ACTA terminate the process of procurement at that time.

In 2008/2009, when LA Metro and partner agencies began work on the EIR/EIS for the I-710 Corridor improvements a major goal of the funding partners and the communities in the Gateway Cities was to incorporate zero-emissions technology into the final alternative. Therefore, an evaluation was conducted of zero-emission options for this corridor. In addition to automated fixed guideway systems, which had been the focus of most of the previous studies, the I-710 Alternative Goods Movement Technology Study also examined electric and/or battery powered trucks. Some of the conclusions reached in the I-710 study included:

a) Automated fixed guideway systems require fixed infrastructure and right-of-way that would interfere with the future growth and efficiency of the ports and intermodal terminals because they would require a large number of loading and unloading points that would need to be physically separated from the truck and rail loading and unloading locations. This would take up valuable land at the marine terminals – land that is needed to accommodate future growth.

b) Some form of electric and/or battery truck technology would enable the greatest flexibility for interfacing with existing terminal facilities and enabling future growth.

The integration of the I-710 Truck Corridor and electrified truck technology was a critical change in direction for regional programs to introduce zero-emission technologies and led to three important conclusions:

1. The HSRT fixed guideway system and the Clean Truck Freight Corridor system outlined in the 2008 RTP would have competed for many of the same goods movement markets, reducing the likelihood that either could have generated sufficient demand in competition with the other to justify the costs of the infrastructure investment.
2. The electrified truck option provides much greater flexibility and broader applications to an array of goods movement markets than would the fixed guideway systems. This allows the Zero-Emission Freight Corridor to play a role as a commercialization platform for zero-emission goods movement technology in the region.
3. There is substantial technology development work underway to deliver electric and hybrid-electric trucks to market and there is a high likelihood that these technologies will start to become commercially available in the timeframe envisioned for the Freight Corridor System.

As a result of these conclusions, SCAG undertook a further review of the technology developments and status of zero-emission truck technologies. The results of this review are summarized in the following sections and presented in the appendices.[2]

Zero-Emission Freight Corridor System Concept and Evaluation

Based on the technology evaluation, the consultant team conducted a high-level screening of technology configurations, focusing on electric/battery truck technologies, to determine the degree to which these configurations could meet a basic set of system requirements:

- Maintaining existing terminal/freight facility operations;
- Ability to meet planned freight corridor operations;
- Ability to enter and exit the freight corridor seamlessly; and
- Produce zero local emission.

Based on this high-level screening, the most responsive electric/battery truck technologies to the requirements of a freight corridor envisioned for the Los Angeles Basin are:

- 100 Percent Battery Truck – These trucks would operate on battery power both on and off of the freight corridor, thus producing zero local emissions. These trucks would not require any specialized infrastructure on the freight corridor, and would not impact existing operations because they would operate almost identically to current standard trucks, and would have the ability to enter and exit the freight corridor seamlessly.
- Electromagnetic Induction Plus Battery Truck – These trucks would receive power from an embedded power source while on the freight corridor, and would operate on battery power while off the freight corridor, thus producing zero local emissions. There would be no physical contact between the truck and the power source embedded within the pavement of the freight corridor. This would allow for the free movement of the trucks while operating on the freight corridor, thereby not impacting existing terminal//freight facility operations and freight corridor operations. The trucks would have the ability to enter and exit the freight corridor seamlessly with no impact to existing operations.
- Overhead Catenary System Plus Battery Truck – These trucks would receive power from an overhead catenary line while operating on the freight corridor, and would operate on battery power while off the freight corridor, thus producing zero local emissions. Although this does still require some contact with a power source, it does not have

---

2 *Technical Memorandum, Task 8 – New Technology Alternatives for Line-Haul Freight: Technology Review*, URS Corporation, November 2010.

the safety issues, nor does it have the infrastructure restrictions that would be associated with a third-rail-powered system. In addition, the catenary wires would not need to extend into terminals because the trucks could operate on battery power within freight facilities. Therefore, the trucks would not impact existing terminal operations and freight corridor operations. Both the electromagnetic induction and overhead catenary system technologies are forms of "wayside power" meaning the power supply for the vehicle while it operates on the freight corridor comes from an electricity source that is part of the roadway and not part of the vehicle.

A system concept of operations was then developed for each of the three promising technology configurations and a system operational and cost analysis was conducted to compare the different configurations. The basic system assumptions can be summarized as follows:

- Off Freight Corridor Operations – The analysis of proximity to markets that was conducted during the screening of freight corridor alignments showed that the SR 60 corridor alignments (including the UP-Adjacent alignment and the San Jose Creek alignment) had a substantial number of warehouse, manufacturing, and truck terminals within 10 minutes travel time of the freight corridor. This established a basic operating assumption for the system. It would be possible to extend the range of the electrified trucks by providing fast-charge battery charging stations (requiring technology development) and by allowing for the use of hybrid-electric technologies (not fully zero local emissions).
- On Freight Corridor Operations – Electric motor/battery trucks were assumed to operate on battery power during all operations. This would require trucks to have a greater battery life than current existing battery-powered vehicles. This would likely require recharging after every trip or the ability to swap out batteries. In the former case, larger fleets of trucks would be required because of the low utilization levels of trucks that would be out of commission charging after every trip. In the latter case, additional expense would be incurred for multiple batteries for each truck. This problem could be alleviated if there are further advances in battery technology in the form of faster battery recharging or significantly higher battery capacities. Electromagnetic Induction Plus Battery Trucks would be powered by an electric traction power supply embedded in the roadway. Off the corridor, the trucks would operate on battery power. If the electromagnetic induction systems can be developed to provide sufficient power to drive the trucks and charge batteries while on the corridor, this could keep the electric trucks operational at all times (without requiring off-corridor charging stations) as long as the destinations off-corridor are relatively close to the corridor (as previously noted). Overhead Catenary System Plus Battery Trucks would allow trucks to be powered by wayside power through the connection of a pantograph or trolley pole connected to overhead power lines. It is assumed that electric/battery trucks would have the ability to recharge their internal batteries while connected to the overhead catenary system. The biggest issues for this type of system would be the ability to quickly and seamlessly detach and attach the pantograph as the trucks move on and off the corridor, vertical clearance requirements on the freight corridor to accommodate the overhead catenary lines, and potential safety issues with regard to unintended contact between the overhead wires and standard vehicles traveling on the freight corridor.
- Freight Corridor Infrastructure Requirements – The 100 Percent Battery Trucks would not require any additional corridor infrastructure or right-of-way but would require the construction of off-corridor charging stations. The Electromagnetic Induction Plus Battery Truck system would require power cables embedded within the freight corridor roadway. Installing these cables into the roadbed at the time the freight corridor is constructed would help minimize costs (also making this technology less applicable to existing infrastructure). This would not necessarily be an issue for the Overhead Catenary System, which could be added to the freight corridor (or any other existing highway) after it was built. Both the Electromagnetic Induction and the Overhead Catenary Systems would require that power substations be built along the freight corridor and this would need to be accounted for in defining right-of-way requirements.

System Operational Analysis

A system operational analysis and an evaluation of benefits and costs of a zero-emission freight corridor system was developed for each of the three most promising technology configurations. One of the greatest areas of uncertainty in the analysis is the degree of market penetration of zero-emission trucks at any given time in the future. The availability of infrastructure (like a zero-emission freight corridor), the existence of market-based incentives (such as the purchase incentive programs that were offered as part of the San Pedro Bay ports' Clean Truck Program), increasing costs of conventional fuels, and/or regulatory requirements could all act to help increase the rate at which zero-emission technologies are adopted by the private sector. At some point, when sufficient market penetration has occurred, it would be possible to restrict access to the freight corridor to zero-emission trucks. The analysis conducted for the Comprehensive Regional Goods Movement Plan and Implementation Strategy considered two different scenarios – one in which initial operation of the freight corridor would allow access by both zero-emission and conventional trucks (users of the freight corridor were assumed to be split 50 percent for each category) and a second in which all users of the freight corridor are assumed to be zero-emission trucks. The analysis also assumed initial operation of the freight corridor in 2020. Only the results of the 100 percent zero-emission freight corridor are presented in this report.[3]

Fleet Size. The analysis used data from the SCAG Heavy-Duty Truck Model runs that were conducted to evaluate performance of the EWFC alignments in order to determine the number of trucks that would be required to complete the number of trips implied by the average daily truck vehicle miles of travel and vehicle hours of travel, accounting for layover time for charging. In the case of electric motor/battery trucks, the number of trucks needed would be double the number needed for the electromagnetic induction and overhead catenary systems because the electric motor/battery trucks would need to go out of service for long periods of time during the day for recharging. Based on current electric/battery truck quick-charge technology, it is assumed that electric motor/battery trucks would need to charge approximately four hours for every 120 miles,[4] and this charge time would be added to the layover time for each truck. Thus, owners would get lower levels of utilization from these trucks. As noted previously, the development of higher capacity batteries or fast-recharge systems could change this requirement. But these technologies would presumably come at an additional cost as compared to the battery and charging systems assumed for this analysis. Allowing for the operation of hybrid electric vehicles would also eliminate the need for the larger fleet size in the case of the electric motor/battery trucks but this would not achieve zero local emissions. The number of trucks that would be needed for each technology configuration is presented in Table 6.6.

Table 6.6 Estimated Fleet Size from 2020-2035
100 Percent Clean Trucks On Corridor

Year	Daily VHT on Truck Corridor	Daily VHT off Truck Corridor[a]	Daily Number of Electric/ Battery System Trucks Required: Electromagnetic Induction/ Battery Truck or Overhead Catenary System/ Battery Truck	Daily Number of Electric/ Battery System Trucks Required: Electric Motor/ Battery Truck
2020	3,600,771	4,246,845	16,349	32,698
2025	3,899,683	4,599,389	17,706	35,413
2030	4,198,594	4,951,933	19,064	38,127
2035	4,497,506	5,304,477	20,421	40,842

Note: Assumes 50 minutes VHT off of the truck corridor for each trip, including estimated layover and off-corridor travel time.

[a] Derived from a preliminary version of the 2012 update to the SCAG RTP) model. 100 percent of total VHT assumed, given 100 percent clean trucks.

[3] Ibid.

[4] Based on current Balqon Technology available. Balqon Corporation, Nautilus XE30, web site: http://www.balqon.com/product_details.php?pid=2, accessed September 13, 2010.

Capital Costs. A summary of the capital costs for the three electric/battery truck system is presented in Table 6.7. Costs are calculated in year 2010 dollars and based on 1) recent component costs for similar projects; 2) cost estimates from advanced technology vendors from the Zero-Emission Container Movement Systems Study conducted for the Port of Long Beach;[5] and 3) information found during the technology review. Capital cost elements included:

- **Traction power facilities (not applicable to electric motor/battery trucks) –** Costs include power substations that are spaced based on the total number of trucks required. It was assumed that substations are located at intervals along the freight corridor to provide even distribution of power, approximately every 1.5 to 2 miles and that there would be different power requirements for the electromagnetic induction and overhead catenary systems.
- **Recharge stations (only applicable to electric motor/battery trucks) –** Due to limited information about recharging system requirements for trucks, the size and costs in this analysis were based on that of recharging stations developed by Nissan for their electric car system.[6] It is assumed that there would be four main recharging station sites along the freight corridor.
- Utilities (primarily power system connections).
- Professional Services (such as engineering).
- **Vehicles –** Incremental vehicle costs (estimated costs of a zero-emission truck less the cost of a standard diesel truck) are estimated based on cost of batteries into the future.

Table 6.7 Summary of Capital Costs
Assuming 100 Percent Clean Trucks (Millions)

Year	Electromagnetic Induction/ Battery Truck	Overhead Catenary System/ Battery Truck	Electric Motor/ Battery Truck
2020	$1,523	$1,809	$2,636
2025	$109[7]	$109	$217
2030	$109	$109	$217
2035	$109	$109	$217

---

5 URS Corporation and Cambridge Systematics, *Port of Long Beach Zero Emission Container Movement System Study*, 2007.

6 Gizmag.com web site. Coxworth, Ben. "Nissan Introduces EV Charger to Hit the Market," web site: http://www.gizmag.com/nissan-quick-ev-charger-to-hit-the-market/15224,accessed, October 20, 2010.

7 The analysis assumes linear growth in the size of the ZEV truck fleet with the same number of new trucks purchased every five years as traffic grows and older vehicles are replaced. While it is likely that prices of ZEVs will decline as the market for ZEVs increases and economies of scale are achieved, no data were available on what types of cost reductions could be achieved in the future. Thus, constant per vehicle costs are assumed in the analysis.

Operating and Maintenance Costs. The operating costs (Table 6.8) are based on electric power costs and power structure maintenance. Truck maintenance costs are assumed to be the same as with current diesel trucks. There are two basic components of the O&M cost estimates:

- **Incremental Energy Costs/Savings (negative numbers indicate savings) –** Electric power costs were estimated using a mid-demand scenario for industrial electricity rates provided by staff from the California Energy Commission (CEC).[8] These costs (between 10-12 cents per kWh) were multiplied by the truck power requirements to determine the total energy costs under an electrified scenario.
- **Power Structure Maintenance (not applicable to electric motor/battery trucks) –** Power structure maintenance is based on recently completed operating and maintenance cost estimates for light-rail projects in California. Because limited information is available for the power structure, maintenance costs of an electromagnetic induction system and overhead catenary system are the same.[9]

Table 6.8 Summary of Operating Costs
Assuming 100 Percent Clean Trucks (Millions)

Year	Electromagnetic Induction/ Battery Truck	Overhead Catenary System/ Battery Truck	Electric Motor/ Battery Truck
2020	$(273)	$(336)	$(363)
2025	$(261)	$(332)	$(364)
2030	$(288)	$(368)	$(404)
2035	$(304)	$(393)	$(434)

Note: Negative Numbers Indicate Operating Savings.

The negative operating costs shown in Table 6.8 indicate a savings (negative incremental costs) relative to the costs of diesel trucks. This is due primarily to the lower costs of energy to power the electric vehicles.

6.4.4 Summary of Electric Truck Evaluation

The evaluation of electric truck options suggest that there are potentially feasible options for developing a zero or near-zero emission system for operation on the freight corridor. While initial capital costs of such a system would be high, the operating cost savings would eventually payback these costs (within seven or eight years for the wayside power systems). Currently, the economics favor the wayside power systems but this is due largely to the limitations of current battery technology. Electric motor/battery trucks would require the construction of new charging infrastructure and would require the purchase of replacement batteries for use while one set of batteries is recharging and the other is in use. In the long-run, there are a number of technologies that would not require wayside power that might prove more economical and more flexible. The emissions reduction potential of any of the technologies would be substantial and should justify a more active public role to help build the market for zero-emission truck technology. The analyses conducted for the I-710 EIR/EIS suggests that electrified trucks have much greater flexibility to serve many different truck markets than would a fixed

[8] CEC staff estimates were developed through 2022. For 2023 through 2035, electricity prices were grown by applying the compound annual growth rate of prices from 2010-2023. Please note that this is not an official CEC forecast of electricity prices. Rates through 2022 were generated by staff utilizing the E3 Calculator.

[9] Based on costs for maintenance of the overhead catenary system power structures from the Santa Clara Valley Transportation Authority's (VTA) light-rail operating and maintenance model. Santa Clara Valley Transportation Authority, Light-Rail System Analysis, 2008.

guideway system and the analysis of the EWFC suggests that there are large potential truck markets located along the alignment that are well within the range of current batteries.

6.4.5 Next Steps

SCAG and its air quality partner agencies have developed a plan and implementation mechanisms (e.g., funding and regulatory mechanisms) to deploy zero and near-zero emission truck technologies as part of a long-term freight system. This program includes a collaborative program of research, development, and demonstration (RD&D) working with private sector technology developers and users. The main elements of this implementation plan are presented in the Table 6.9.

Table 6.9 Trucks – Agency Major Implementation Actions

Year(s)	Agency	Agency Action
2012	SCAG	Incorporate "footprint" for regional truck lanes to accommodate potential use of wayside power in financially constrained 2012 RTP. Include funding to support truck and wayside power evaluation and demonstration efforts into financially constrained RTP. Implement plan of advocacy to secure action by Federal or other governments where required to implement any related elements of the SIP or RTP; include evaluation of impacts of zero-emission technologies on national priorities, (e.g., energy security, energy cost certainty, interstate transportation, climate protection).
2012-2014	SCAG, with AQMD/ ARB on SIP	Evaluate potential truck technology implementation and funding mechanisms, including: regulatory requirements; incentives (local, state, Federal, interstate cooperative); differential tolls; and public-private partnerships. Evaluate potential funding mechanisms for truck infrastructure (e.g., wayside power), including Federal, state, local government funding; tolling; public-private partnerships; and electric utility funding of corridor construction.
2015	SCAG, with AQMD/ ARB on SIP	Resolve need for wayside power infrastructure for trucks on I-710 and other corridors beyond near-dock railyards, including East-West corridor; decision would be based upon whether zero and near-zero emission technologies would have sufficient range without wayside power. If wayside power is needed, incorporate such technology description into RTP constrained plan and next major SIP. Develop and incorporate recommendations regarding type of funding and implementation mechanisms (including infrastructure needed) into RTP constrained plan and next major SIP, including: • Strategy description and timeframe for any rules; and • Strategy description, potential funding sources and timeframe for any incentives.

6.5 Truck Bottleneck Relief Projects

6.5.1 Project Description

Chapter 4 identified 50 locations that represent areas with particularly high levels of truck delay. These locations are described in Chapter 4 and in this chapter as the region's highest priority truck bottlenecks.

6.5.2 Benefits

Analysis revealed that the top 50 congested areas/bottlenecks contribute over one million hours of truck delay annually to SCAG roadways. In a recent analysis of critical issues affecting the trucking industry conducted by the American Transportation Research Institute (ATRI), traffic congestion ranked near the top in 2011 after being less of a concern in 2009-2010 as a result of the economic downturn.[10] Besides causing delays to other highway users, heavy truck congestion results in wasted labor hours and fuel. In 2010, it was estimated that the cost of truck congestion in 439 major urban areas was approximately $23 billion.[11] Truck congestion in urban areas within the SCAG region resulted in approximately $2.6 billion in costs.[12] Given that driver wages and fuel costs represent over 50 percent of total motor carrier costs, truck congestion has major impacts on the bottom line of the trucking industry. Truck bottlenecks are also emission "hot spots," and generally have significantly degraded localized air quality caused by increased idling from passenger vehicles and trucks.

Addressing these bottlenecks could yield substantial delay reduction, as well as associated emissions reduction and safety benefits.

6.5.3 Evaluation[13]

Chapter 4 described the process used in the Comprehensive Regional Goods Movement Plan and Implementation Strategy to identify the 50 top truck bottlenecks in the SCAG region. Development of the truck bottleneck relief strategy had several elements:

- Identify projects already in the pipeline that may address the bottleneck.
- Identify projects that are not already in the pipeline but that have been identified in other studies and that could address the bottlenecks.
- Interview regional stakeholders/members of the Comprehensive Regional Goods Movement Study and Implementation Plan Steering Committee to identify other projects that might be in various phases of study to determine if any have the potential to address priority truck bottlenecks.
- Identify bottlenecks for which there are no planned projects and develop project concepts for at least a sample of the highest priority bottlenecks.

Once a complete list of potential projects was identified they were mapped in GIS along with the bottlenecks that already have been described in Chapter 4 (see Figure 6.9). Table 6.10 lists the locations of these bottlenecks.

---

[10] http://www.atri-online.org/2011_top_industry_issues.pdf.

[11] Texas Transportation Institute 2011 Urban Mobility Report.

[12] Texas Transportation Institute 2011 Urban Mobility Report. Urban areas as defined in the report include Los Angeles-Long Beach-Santa Ana, Riverside-San Bernardino, Lancaster-Palmdale, Bakersfield, Indio-Cathedral City-Palm Springs, and Oxnard-Ventura.

[13] A more detailed description of the bottleneck evaluation process is described in a white paper that is included in the appendices to this final report.

Table 6.10 Initially Identified Truck Bottleneck Relief Projects

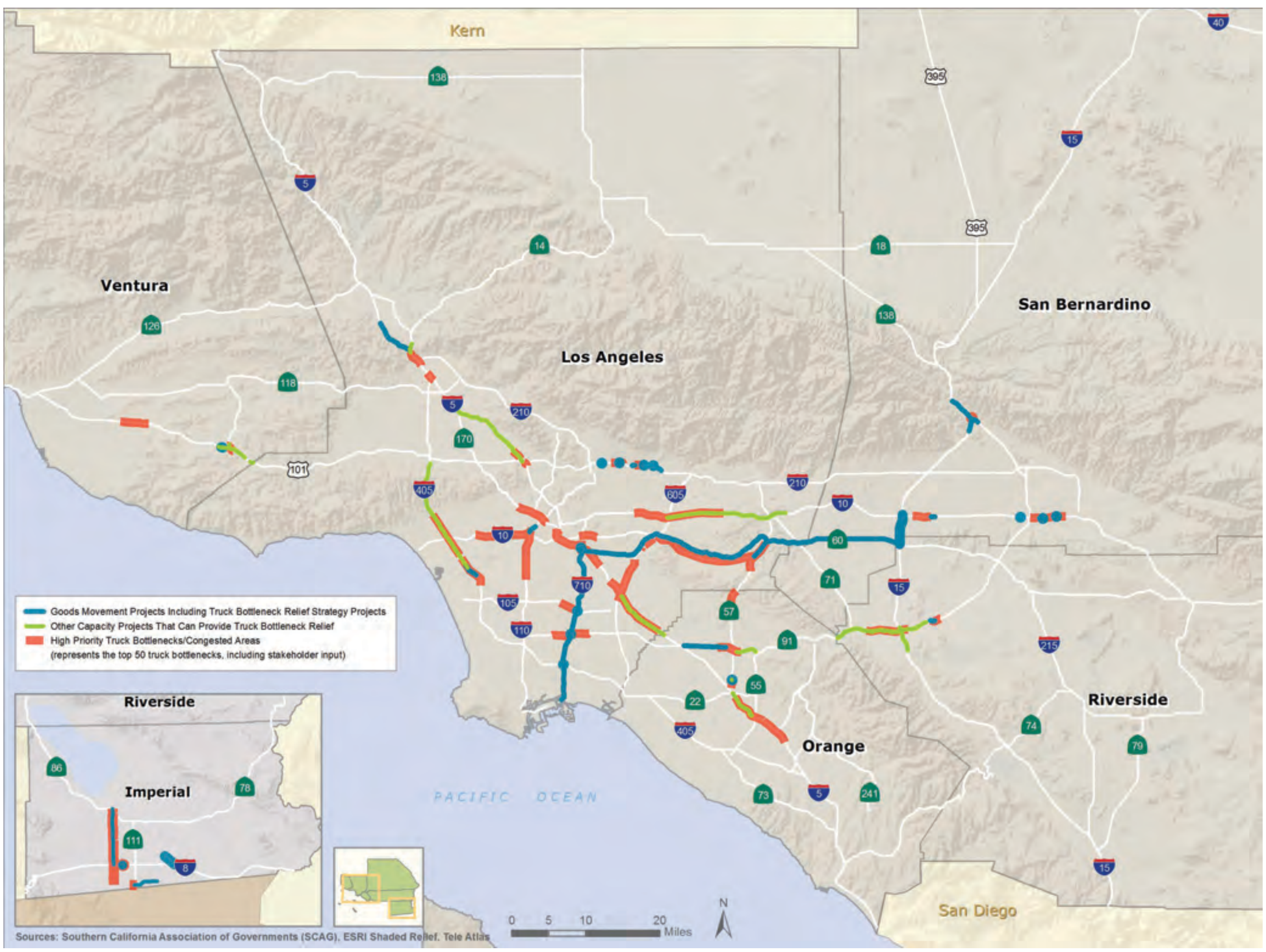
Map ID	County	Project Description	Timeframe (Short, Medium, Long)
I.1	Imperial	Widen SR 98 from V.V. Williams Avenue to Ollie Avenue and intersection improvements of SR 98 and Cesar Chavez from 2 to 4 lanes (Phase 1B).	S
I.2	Imperial	Widen SR 98 from Ollie Avenue to Rockwood Avenue from four to six lanes.	S
I.3	Imperial	Widen SR 98 from All American Canal to V.V. Williams Avenue from two to four lanes.	M
I.4	Imperial	Widen SR 98 from All American Canal to Dogwood Road from two to four lanes.	M
I.5	Imperial	SR 98 or Jasper Road from SR 111 to SR 7: widen and improve to four/six lanes.	L
I.6	Imperial	Forrester Road Corridor (Proposed SR 86): widen and improve to four-lane arterial from I-8 to SR 78.	S
I.7	Imperial	Reconstruct I-8 interchange at Imperial Avenue from a two-lane to a four-lane diamond-type overcrossing; realign and reconstruct on- and off-ramps, and provide access to Imperial Avenue south of I-8.	M
I.8	Imperial	Widen SR 115 from I-8 to Evan Hewes Highway.	L
I.9	Los Angeles	Westbound I-210: connect and converge Altadena Drive on-ramps into a single on-ramp.	M
I.10	Los Angeles	I-210 westbound at Lake Avenue: construct center drop ramp with two drop ramps to serve HOV and general purpose vehicles heading toward SR 134.	M
I.11	Los Angeles	Westbound I-210: connect and converge Santa Anita Avenue on-ramps into a single on-ramp.	M
I.12	Los Angeles	I-210: construct westbound auxiliary lane from Santa Anita Avenue to Baldwin Avenue and eastbound auxiliary lane from Santa Anita Avenue to Huntington Drive.	M
I.13	Los Angeles	I-210: modify Rosemead Boulevard/Michilinda Avenue interchange; converge westbound I-210 on-ramps.	M
I.14	Los Angeles	I-210: modify north side of I-210 at Baldwin Avenue interchange and eliminate collector-distributor.	M
I.15	Los Angeles	I-110: in Los Angeles from 8th Street on-ramp to I-110/I-10 connector – construct northbound and southbound auxiliary lanes and modify ramps; convert existing southbound auxiliary lane to optional lane and modify ramps; I-110 northbound Harbor Freeway, from north end of 12th Street undercrossing to north end of the 7th Street undercrossing, add storage lane on the mainline and reconstruct ramp.	S
I.16	Los Angeles	I-710: reconstruct I-710 interchanges at I-5, at I-405, at SR 91, and at I-105. As part of the I-710 Corridor Program proposing four truck lanes (ports to rail yards), 10 mixed-flow lanes (ports to SR 60).	S
I.17	Los Angeles	I-405: in Los Angeles from La Tijera Boulevard to Jefferson Boulevard – add auxiliary lane.	S
I.18[a]	Los Angeles	Other potential relief projects – concept plans under review.	L
I.19	Orange	SR 57: add one mixed-flow lane northbound between Orangewood Avenue and Katella Avenue.	M
I.20	Ventura	U.S. 101: in Thousand Oaks; improvements at various locations between Los Angeles County line and Moorpark Road; convert auxiliary lanes to mixed-flow lanes, add one lane in each direction by shifting centerline northwards and widening on northbound side, realign ramps, construct soundwalls, widen three bridges (Hampshire Road, Conejo School, and Moorpark Road) on north side; improve U.S. 101/SR 23 Connectors.	S

Table 6.10 Initially Identified Truck Bottleneck Relief Projects (continued)

Map ID	County	Project Description	Timeframe (Short, Medium, Long)
I.21	Riverside	SR 91 from Magnolia Avenue to between Merced Drive and Fillmore Street (PM 10.6 to 11.6): reconstruct and widen from four to six lanes and reconstruct/widen interchanges and ramps.	M
I.22	San Bernardino	I-10 Tippecanoe Avenue interchange – add eastbound off-ramp auxiliary lane from Waterman Avenue on-ramp to Tippecanoe Avenue off-ramp and widen bridge (noncapacity).	S
I.23	San Bernardino	Improve I-10 interchange at Mt. Vernon Avenue.	M
I.24	San Bernardino	Improve I-10 interchange at Mountain View Avenue.	M

Notes: [a] *Project I.18 is not mapped.*
Projects not listed in the order of priority.
Short-term (S) (2012-2019); Medium-term (M) (2020-2027); and Long-term (L) (2028-2035+).

Figure 6.9 Map of High-Priority SCAG Region Truck Bottlenecks/Congested Areas and Location of Existing Planned Projects that Could Help Relieve Bottlenecks



Once the bottlenecks and projects lists and maps were completed, the next step was to identify which priority bottlenecks may be addressed by existing or planned projects. The process followed these steps:

- **Determine proximity of projects to bottlenecks –** The first step was to identify any highway projects that add capacity, improve interchanges, or make operational improvements in the vicinity of a particular bottleneck. Specifically, a highway project within a mile of a bottleneck segment was flagged as one that may address that bottleneck pending further review. In some cases, there were multiple projects that could affect a single bottleneck.
- **Individually review bottlenecks and projects to determine whether a project may help mitigate the bottleneck –** Traffic operations specialists analyzed specific bottlenecks and associated projects to determine if a project could have an impact on a specific bottleneck. The outcome of this analysis is a list of bottlenecks and associated projects that may mitigate the impacts of the bottleneck. For bottlenecks that have no associated projects, new project concepts have been developed.

Of the original list of high-priority truck bottlenecks, there were seven locations for which no planned project was identified. These locations are presented in Table 6.11 and correspondingly mapped in Figure 6.10.

Table 6.11 High-Priority Truck Bottlenecks in the SCAG Region with No Planned Project

Bottleneck No	Highway	Direction	Project Limits	County	Annual Total Truck Hours of Delay (ATTD) in Hours
4	101	SB	From Western Avenue to Echo Park Avenue	Los Angeles	38,720
10	91	WB	From Paramount Blvd. to S. Acacia Avenue	Los Angeles	31,970
19	101	NB	From CA 60/Soto Street to N. Alameda Street	Los Angeles	25,350
20	5	SB	From E. Olympic Blvd. to E. Washington Blvd.	Los Angeles	25,190
23	5	SB	From E. 4th Street to Grande Vista Avenue	Los Angeles	23,710
29	10	EB	From Venice Blvd. to I-110/Harbor Freeway	Los Angeles	21,590

Figure 6.10 Locations of Truck Bottlenecks with No Planned Projects

Of these, three stand out as particularly regionally significant truck bottlenecks due to the high volumes of truck traffic and the associated truck delay. These are the two locations on I-5 (Bottlenecks 19 and 20) and the bottleneck on SR 91 in the vicinity of I-710 (Bottleneck 10). Upon further investigation, it was determined that project concepts have been developed at both of these. The bottleneck at the SR 91/I-710 interchange has been studied as part of the LA Metro/Gateway Cities Council of Governments I-605 Congestion Hot Spots Study and project concepts were identified upon review of the preliminary engineering studies of this interchange. The bottlenecks along I-5 in the vicinity of the I-710 interchange are being evaluated as part of a study by Caltrans and LA Metro of I-5 between I-605 and I-710 and project concepts have been developed that would address the two bottlenecks. Further detail on these bottlenecks and project concepts is available in a technical memorandum prepared by URS Corporation for the Comprehensive Regional Goods Movement Plan and Implementation Strategy (see appendices).[14]

6.5.4 Next Steps

Truck bottleneck relief projects will be further evaluated by individual subregions. For example, LA Metro is in the process of contracting for Phase 2 of the Gateway Cities COG Transportation Strategic Plan. The scope of work includes mesoscopic simulation of the entire Gateway Cities subregion and microscopic simulation of individual corridors and projects. This will help complete traffic engineering and project definition of several of the projects. A number of the projects do not have fully

[14] *SCAG Regional Goods Movement Study – Truck Bottleneck Locations*, URS Corporation, August 2012.

committed funding and will continue to seek funding as they move closer to construction. By identifying these projects as "truck bottleneck relief projects" they may become eligible for increased Federal share of funding or they may become eligible for funds that become available through a future national freight program.

6.6 San Pedro Bay and Hueneme Ports Access Highway Projects and Border Crossing Projects

6.6.1 Project Description

The following major port-access highway projects are included in the Plan:

- Gerald Desmond Bridge Replacement.
- South Wilmington Grade Separation.
- I-110/SR 47 Interchange and John S. Gibson Intersection/NB I-110 Ramp Access.
- C Street/I-110 Access Ramp Improvements.
- Hueneme Road widening between Ventura Road and Rice Avenue.

The expansion of the Calexico East Port of Entry is also included in the plan.

Gerald Desmond Bridge Replacement

One of the most significant highway projects proposed for the port area is the replacement of the Gerald Desmond Bridge. The Gerald Desmond Bridge is the primary link from Terminal Island to the Long Beach Freeway (I-710). The new bridge, excluding approach structures, would be 2,000 feet long, and it would be elevated 200 feet above the Mean High Water Line (MHWL) of the Back Channel. The existing bridge, with 150 feet of vertical clearance, is not tall enough to accommodate the latest generation of container vessels. In July 2012 the Port of Long Beach Harbor Commission approved a $649.5 million design-build contract for the project. The full cost of the project is estimated at $1,001,617.

I-110/SR 47 Interchange and John S. Gibson Intersection/NB I-110 Ramp Access

On the Los Angeles side of the harbor the I-110/SR 47 Interchange and John S. Gibson Interchange/NB I-110 Ramp Access project is intended to greatly improve traffic flow and reduce accidents at these major interchanges. The project will cost an estimated $35.05 million.

C Street/I-110 Access Ramp Improvements

The project is located in Wilmington on the C Street/Harbor Freeway (I-110) off-ramp. The project will make modifications to the northbound on-ramp and off-ramp; and realign Harry Bridges Boulevard. The project is necessary to improve the existing poor level of service, nonstandard weaving distance, and traffic circulation and operation in the area. The total project cost is estimated to be about $23.98 million.

South Wilmington Grade Separation

The project is located in South Wilmington, between Fries Avenue and Marine Avenue and between Harry Bridges and Pier A Street. The project will construct a grade separation.

The project is required to relieve excessive delay, minimize traffic congestion, reduce queues, and improve air quality caused by multiple existing at-grade railroad crossings of the West Basin Rail Line that connects to the Alameda Corridor. When a train is present, it completely blocks access to the South Wilmington. This project will enable unimpeded vehicular access to the entire South Wilmington area as well as enable the maximized usage of an existing and proposed on-dock rail yards thus resulting in fewer truck trips on the region's streets and highways. The total project cost is estimated to be about $78.384 million.

Hueneme Road Widening between Ventura Road and Rice Avenue

Hueneme Road is a preferred access route for trucks to/from the Port of Hueneme, as specified in the *Cities of Port Hueneme/Oxnard Truck Traffic Study*[15]. The project involves widening the road from two to four lanes between Ventura Road and Rice Avenue.

Calexico East Port of Entry Expansion

The proposed project is to increase the number of commercial vehicle inspection lanes and booths from the existing 3 to 6 lanes and booths; and widen bridge over the All-American Canal, which serves as U.S./Mexico Border. The estimated project cost is $90 million.

6.6.2 Benefits

Gerald Desmond Bridge Replacement

The replaced Gerald Desmond bridge is expected to have the following benefits: a) reduced uphill grades will reduce incidence of very slow moving heavy trucks; b) added shoulders can be used in case of breakdown and emergency; c) shifting of traffic at intersections in the area reduces the number of conflicting movements; d) speed limit on the bridge will increase from 45 mph to 55 mph; e) the bridge is expected to reduce delay by 143 vehicle-hours of delay per day; and f) the emissions are estimated to be reduced by about 410 pounds per day.

I-110/SR 47 Interchange and John S. Gibson Intersection/NB I-110 Ramp Access

This project will reduce congestion and reduce accidents by eliminating weaving between the slow-moving, on-ramp traffic from San Pedro and the fast-moving bridge traffic from Long Beach to improve the connection between the SR 47 and I-110 Freeway. This additional lane will continue to the John S. Gibson off-ramp with two lanes from the existing one lane, thus improving the intersection capacity with an overall improved level of service (LOS). Overall, the project benefits include improved safety, traffic conditions, traffic circulation and operation and air quality.

C Street/I-110 Access Ramp Improvements

This project will improve the flow of traffic from the I-110 Freeway ramps at C Street by consolidating two closely spaced intersections and facilitating heavy right-turn volumes with free-flowing turn lanes. Improved connectivity to the designated National Highway Intermodal Connectors of Figueroa Street and Harry Bridges Boulevard is another benefit. Several stakeholders will benefit from this improvement, including Trapac, Yang Ming, and China Shipping Terminals, as well as the community. Overall, the project benefits include improved safety, traffic conditions, traffic circulation and operation and air quality.

South Wilmington Grade Separation

The project benefits include: a) existing and future peak period hour levels of service will improve from an unacceptable F to A; b) provide grade-separated access so that the movement of trucks and trains do not impede each other; and c) improve safety by removing potential conflict between trains and vehicles.

Hueneme Road Widening between Ventura Road and Rice Avenue

The widening of Hueneme Road will reduce traffic congestion caused by trucks, including trucks accessing the Port of Hueneme.

Calexico East Port of Entry Expansion

The project will significantly reduce delay for vehicles crossing the U.S./Mexico border.

---

[15] *Cities of Port Hueneme/Oxnard Truck Traffic Study, Final Report*, IBI Group, prepared for SCAG, June 5, 2008

6.6.3 Evaluation

These projects were evaluated by the projects' sponsors, including the Port of Long Beach, Port of Los Angeles, and Port of Hueneme. A final EIR/EA is available for the Gerald Desmond Bridge Replacement Project.[16]

6.6.4 Next Steps

Project sponsors are proceeding with project funding and implementation.

6.7 Mainline Rail Capacity Enhancements

6.7.1 Project Description

As described in Chapter 4, freight rail traffic is expected to increase significantly by 2035, driven largely by growth in container traffic at the ports, but also due to expanding domestic commerce. The projection of rail traffic warrants significant improvements to the railroad mainlines in the region. The recommended improvements and their projected costs are shown in Table 6.12.

Provided below is a brief description of each project:

- The Colton crossing rail-to-rail grade separation involves elevating the east-west Union Pacific tracks over the north-south BNSF line. This project is funded by a $33.8 million TIGER I grant, $91 million from Prop 1B TCIF, and railroad funds.
- Improvements to the BNSF Cajon Subdivision include installing a third main track and a fourth main track on specific segments, exceptional earthmoving, crossovers, and bridges across multiple culverts.
- Improvements to the BNSF San Bernardino Subdivision include a third main track, as well as a fourth main track along the Hobart to Fullerton segment. Caltrans has provided $121.8 million for the triple tracking from Serapsis (MP 151.1) to Valley View (MP 158.7).
- Improvements to the UP Mojave Subdivision include a second main track over a key segment and a "flying junction" at Rancho (W. Colton).
- Improvements to the UP Alhambra Subdivision include double tracking key segments and route connections in Pomona.

There are no improvements recommended for the UP Yuma Subdivision or the UP Los Angeles Subdivision.

[16] http://www.polb.com/environment/docs.asp.

Table 6.12 Estimated Cost of Mainline Rail Improvements
Millions of Nominal Dollars

Mainline Rail Improvements	Estimated Costs
Colton rail-to-rail grade separation	$243.6
BNSF Cajon Subdivision	–
Barstow to Keenbrook	$762.1
BNSF San Bernardino Subdivision	–
Colton Crossing to Redondo Junction	$1,188.7
UP Mojave Subdivision	–
Devore Road to West Colton (including Rancho Flying Junction)	$522.0
UP Alhambra Subdivision	–
West Colton to City of Industry	$376.1
UP Los Angeles Subdivision	$0.0
UP Yuma Subdivision	$0.0
Total Mainline Rail Improvements	$3,092.4

Source: Estimates based on Robert C. Leachman, Regional Rail Simulation Update Summary Report, prepared for SCAG, November 2011. Estimates consistent with "Modified Status Quo" Alternative. Colton Crossing grade separation cost updated from $116 million (Leachman) to $208 million in 2010 (SANBAG) (http://www.coltoncrossing.com/faqs.htm). Estimates have been inflated to nominal dollars using 3.2 percent annual inflation rate.

6.7.2 Benefits

The proposed mainline track improvements will provide sufficient mainline capacity to handle projected 2035 demand in freight and passenger rail traffic. The projects are also designed to reduce projected 2035 regional train delay to year 2000 levels. By providing sufficient capacity for projected levels of rail traffic the Plan helps to maintain the SCAG region's competitive position as the nation's principal gateway for international containerized cargo.

As discussed in more detail in Section 6.7.3, the Plan also recommends the rerouting of several UP trains between Pomona and Riverside, which would result in reduced conflicts between trains in the most congested segment of track through downtown Riverside. The rerouting of UP trains would also mean that an estimated $670 million in track improvements on the UP line between Pomona and Riverside could be avoided.

6.7.3 Evaluation

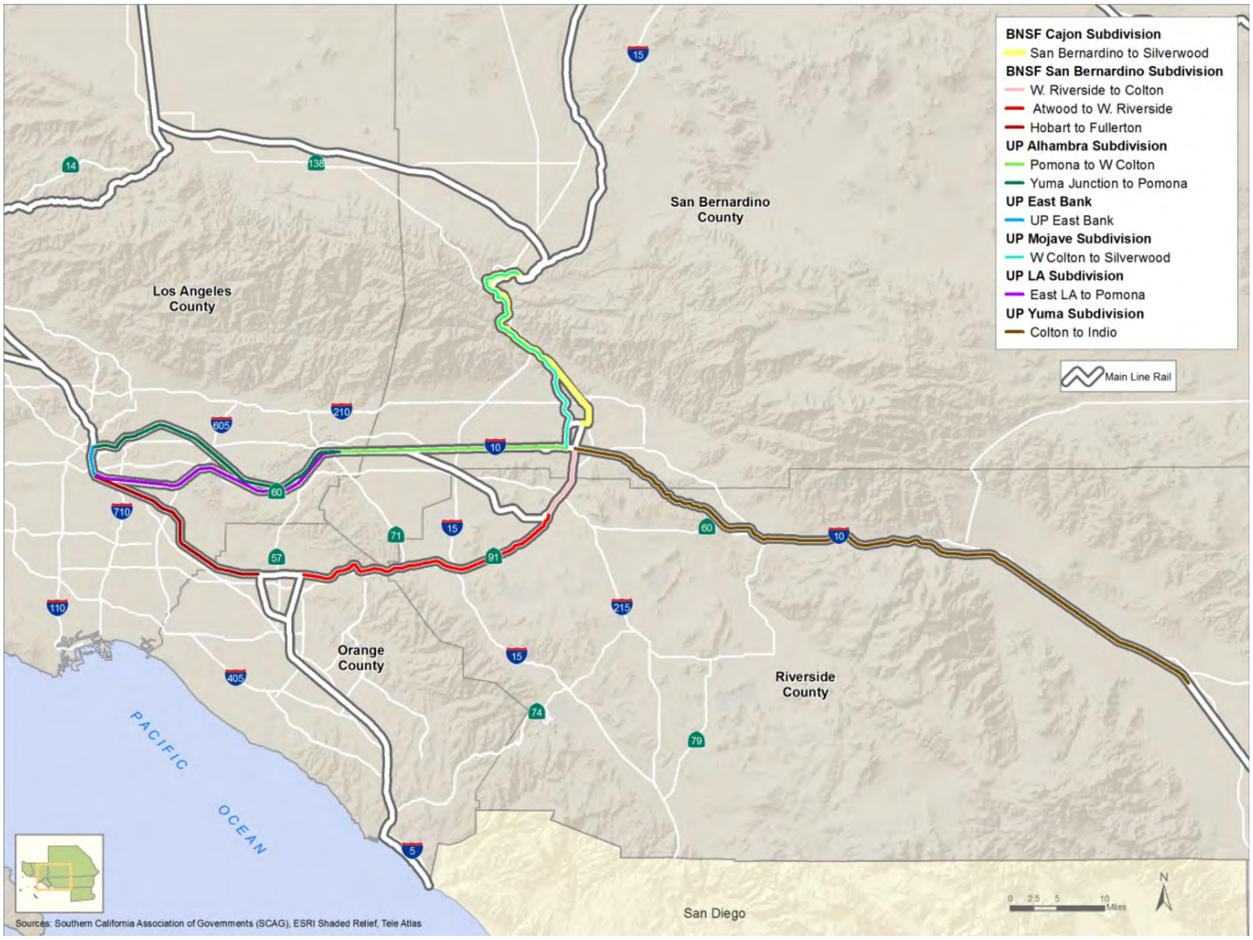
The *Regional Rail Simulation Update Summary Report*[17] evaluated the mainline capacity requirements for projected levels of train traffic in 2035 on the BNSF and UP lines. Computer simulation techniques were used to evaluate the required improvements in rail capacity necessary to meet projected volumes. Projected train delays in 2035 were compared to those occurring in 2000. In the simulation model, track improvements (mostly the addition of track, e.g., going from two main tracks to three main tracks) were added to the 2035 network so that train delays would not exceed 2000 levels.

The regional railroad network is shown in Figure 6.11. Major segments of track are identified.

---

[17] Robert C. Leachman, *Regional Rail Simulation Update Summary Report*, prepared for SCAG, November, 2011.

Figure 6.11 Regional Railroad Mainlines and Major Track Segments



Track requirements depend on how many trains are routed on the various lines of the BNSF and UP. BNSF trains use only one corridor, but UP operates on two main corridors east of downtown Los Angeles. The UP Alhambra and Los Angeles Subdivisions are used to some extent as a paired double track, with eastbound trains operating via the Los Angeles Subdivision from Redondo Junction or East Los Angeles to West Riverside, and then via trackage rights over BNSF through Riverside up to Colton. (See Figure 6.12 depicting "Status Quo" routing of UP trains.). Because of the locations of certain terminals, however, about a fourth of the UP trains must move against the current of traffic. For example, auto trains terminating at Mira Loma must use trackage rights over BNSF Colton – West Riverside and then operate westbound over the Los Angeles Subdivision to Mira Loma.

Figure 6.12 Schematic of Status Quo Routing of Union Pacific Trains

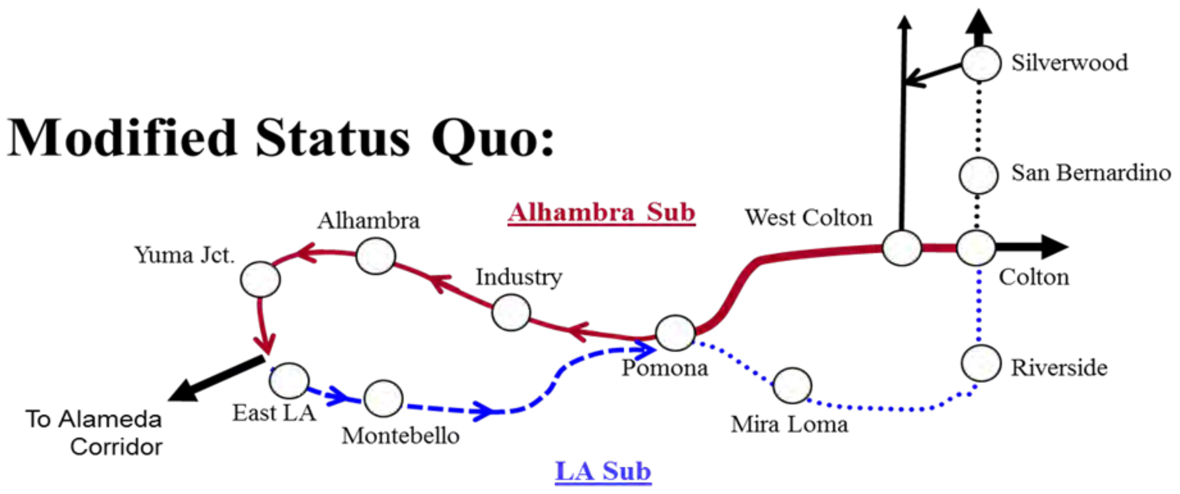
Source: Robert C. Leachman, Regional Rail Simulation Update Summary Report, prepared for SCAG, November, 2011.

The *Inland Empire Main Line Rail Study – 2010 Update* evaluated alternative routing strategies for UP trains to meet the following goals:

- Save capital costs;
- Reduce risks and impacts;
- Reduce train volumes through the worst bottleneck (Riverside-Colton);
- Avoid the most costly line expansion (UP Pomona-Riverside line);
- Separate Metrolink from heavy UP traffic; and
- Route freight lines where most environmentally friendly (but sustain service to all rail terminals).

A complete description of the various routing alternatives can be found in the *Regional Rail Simulation Update Summary Report*. One option studied is referred to as the ***Modified Status Quo,*** which is depicted in Figure 6.13. In this scenario, operations west of Pomona are the same as in the Status Quo (i.e., most UP trains follow a one-way loop westbound on the Alhambra Subdivision and eastbound on the Los Angeles Subdivision). East of Pomona, however, under the Modified Status Quo routing, trains that do not have to use the Los Angeles Subdivision (such as Mira Loma-bound auto trains) are routed via the Alhambra Subdivision from Pomona to West Colton. For the train forecast used in the study, the Modified Status Quo alternative reduces the total through train counts in 2035 through downtown Riverside and downtown San Bernardino by 41 and 10 trains per day, respectively. This alternative concentrates about 92 percent of UP through train movements via West Colton versus only 8 percent via the UP Los Angeles Subdivision through Riverside.

Figure 6.13 Schematic of Modified Status Quo Routing of Union Pacific Trains



Source: Robert C. Leachman, Regional Rail Simulation Update Summary Report, prepared for SCAG, November 2011.

There are a number of key advantages to the Modified Status Quo routing scenario:

- Routing trains via the UP Los Angeles Subdivision involves use of trackage rights over the BNSF San Bernardino Subdivision between Colton Crossing and West Riverside. This is the most heavily utilized line segment in the Los Angeles Basin. Expansion of the capacity of this segment to accommodate 2035 traffic levels is relatively difficult and expensive under the Status Quo alternative, requiring a fourth main track plus flying junctions to enter and exit BNSF tracks. Moreover, double-tracking the remaining portions of the UP Los Angeles Subdivision would be very costly, involving duplication of the lengthy Santa Ana River bridge and significant property-taking and earth removal in Riverside.
- The cost of mainline rail improvements under Modified Status Quo routing is $670 million less costly than the improvements needed under Status Quo routing. Expansion of capacity along the UP Alhambra Subdivision between West Colton and Pomona is much less costly and is consistent with UP's stated capital investment plans.
- Shifting UP trains operating between Cajon Pass and Pomona off the BNSF line and the UP Los Angeles Subdivision and onto the UP Mojave and UP Alhambra Subdivisions reduces conflicts between Metrolink commuter trains and UP freight operations.

For these reasons, the mainline track improvements associated with the Modified Status Quo alternative are included in the SCAG 2012 RTP/SCS. It is recognized, however, that only the UP controls the actual routing of UP trains.

6.7.4 Next Steps

The Colton Crossing is under construction. UP and BNSF will proceed with other track improvements when warranted by traffic levels. The freight railroads will also continue to negotiate with Metrolink regarding shared use of railroad corridors. There will also be continued discussions between the railroads and the California High-Speed Rail Authority regarding a coordinated implementation strategy for rail improvements.

6.8 On-Dock Rail Yard Enhancements and Port-Area Railroad Improvement Projects Outside of Marine Terminals

Intermodal lift capacity and port-area rail facilities are critical aspects of railroad infrastructure in Southern California. There is insufficient intermodal lift capacity at existing intermodal terminals in the region to accommodate the projected growth in combined international and domestic intermodal traffic (see Chapter 4). This section discusses significant improvement projects that have been proposed for new on-dock yards and related support facilities at the Ports. Section 6.9 discusses major improvements to near-dock yards.

Since a substantial amount of the growth in demand will come from port growth, on-dock and near-dock terminal capacity expansion is critical. Building these proposed terminal expansion projects will allow more of the port cargo to be loaded on-dock, significantly reducing truck traffic to off-dock facilities and associated emissions and community impacts.

The demand for intermodal lifts is expected to nearly triple from approximately 4.5 million lifts in 2010 to 13.3 million lifts in 2035. These figures include demand for three markets: Inland Point Intermodal (IPI) containers, transloaded containers, and pure domestic containers. The Plan includes significant improvements to on-dock and near-dock rail yards to accommodate the demand for IPI railroad traffic (marine containers moved by rail without transloading). It is clearly beneficial from an environmental standpoint to accommodate IPI demand as close to the ports as possible. On-dock yards eliminate the need for trucking of containers altogether. As discussed in Section 6.9, near-dock yards require a short 5-mile dray from the ports, but they eliminate longer trips (over 20 miles) to the off-dock yards near downtown Los Angeles. Therefore, the Plan recommends significant expansion of on-dock and near-dock intermodal rail yards. Accommodating total demand (including transload and pure domestic demand) may require increased capacity of off-dock yards, including Hobart Yard, East Los Angeles Yard, Los Angeles Transportation Center (LATC), and City of Industry Yard. Just as the near-dock yards and modernized on-dock yards will use wide-span gantry cranes for greater efficiency, these off-dock yards could install the same type of equipment to increase capacity without necessarily requiring more land.

6.8.1 Project Description

The Ports of Los Angeles and Long Beach have plans for major expansion of their on-dock yards and related facilities. These projects are primarily designed to facilitate on-dock rail service for containerized cargo; however, the rail infrastructure projects outside of marine terminals also reduce delay and increase efficiency for non-container trains; (e.g., bulk trains and automobile trains).

For each port, Table 6.13 lists rail access projects outside of marine terminals and Table 6.14 lists on-dock rail projects. Total estimated costs are shown for each category of project.

Table 6.13 POLB and POLA Rail Infrastructure Projects Outside Marine Terminals and Costs

POLB Rail Infrastructure Projects Outside Marine Terminals	Costs (Millions)
Pier F Support Yard[b]	
Track Realignment At Ocean Boulevard	
Pier B Street Realignment (Phase 1)	
Terminal Island Wye Track Realignment	
Reconfiguration of CP Mole	
Navy Mole Road Storage Rail Yard	
Pier B Rail Yard (Phase II – 9th Street)	
Pier B Rail Yard (Phase III – 10th/12th Street)	
POLA Rail Infrastructure Projects Outside of Marine Terminals	
West Basin Rail Access Improvements	
Pier 400 Second Lead Track	
Grand Total POLB and POLA Rail Infrastructure Projects Outside of Marine Terminals	$1,537.9

Source: Port of Los Angeles and Port of Long Beach.

Table 6.14 POLB and POLA On-Dock Rail Projects and Costs

POLB On-Dock Rail Projects	Costs (Millions)
Pier G New North Working Yard	
Pier G South Working Yard Rehabilitation	
Middle Harbor Terminal Rail Yard (3 phases)	
Pier A On-Dock Rail Yard Exp. to Carrack	
Pier A On-Dock Rail Yard East of Carrack	
Pier S On-Dock Rail Yard	
Pier J On-Dock Rail Yard Reconfiguration	
Pier G Metro Track Improvements	
POLA On-Dock Rail Projects	
Pier 400 On-Dock Rail Expansion (Phase I)	
Pier 300 On-Dock Rail Expansion	
Pier 400 On-Dock Rail Expansion (Phase II)	
West Basin Rail Project	
TOTAL POLB and POLA On-Dock Rail Projects	$998.1

Source: Port of Los Angeles and Port of Long Beach.

6.8.2 Benefits

The principal benefit of on-dock rail service is that it avoids the trucking of containers to off-dock rail yards, thus reducing traffic congestion, fuel consumption, accidents, and air pollution. In addition, on-dock rail also saves the cost of drayage. A typical 8,000-foot intermodal train carries 280 40-foot containers. Every train eliminates the truck trips associated with moving these 280 containers, including associated bobtail and bare chassis moves.

6.8.3 Evaluation

The Ports have evaluated the benefits of on-dock rail use in several recent EIRs, including the Middle Harbor Redevelopment Project[18] and Berths 302-306 (APL) Container Terminal Project.[19]

6.8.4 Next Steps

The Port of Long Beach currently is evaluating the impacts of the Pier B On-Dock Rail Support Facility, and a draft EIR is expected to be released in early 2013.

6.9 Near-Dock Rail Yard Enhancements

6.9.1 Project Description

The Plan includes two major near-dock[20] rail yard projects:

- BNSF has proposed to build a new near-dock rail yard known as the *Southern California International Gateway (SCIG).* It is proposed to have a capacity of 1.5 million lifts per year.
- UP has proposed to expand the capacity of the existing *Intermodal Container Transfer Facility (ICTF)* from 800,000 lifts currently to 1.5 million lifts per year.

The Port of Los Angeles has released the Draft Environmental Impact Report/Environmental Impact Statement (DEIR/DEIS) for the SCIG project,[21] and the ICTF Joint Powers Authority currently is preparing the DEIR/DEIS for the ICTF project.[22]

The SCIG project is planned to have a maximum capacity of 1.5 million lifts or 2.8 million TEUs.[23] It would be located approximately four miles to the north of the Ports, primarily on Los Angeles Harbor District land in the City of Los Angeles, although portions of the proposed project would also be located on nearby land in the cities of Carson and Long Beach (Figure 6.14). BNSF would operate the SCIG Project under a 30-year lease from approximately 2016 to 2046.

---

[18] http://www.polb.com/environment/docs.asp.

[19] http://www.portofla.org/EIR/APL/DEIR/APL_Final_EIS_EIR_May%202012.pdf.

[20] "Near-dock" refers to rail yards that are located within about 5 miles from the ports. "Off-dock" usually refers to rail yards that are further than five miles from the ports, but near- and off-dock yards are sometimes referred to as "off-dock."

[21] http://www.portofla.org/EIR/SCIG/RDEIR/rdeir_scig.asp.

[22] The ICTF Joint Powers Authority (JPA) is a public entity created by the Cities of Long Beach and Los Angeles in 1983 to oversee the development and operation of the ICTF.

[23] When describing intermodal volumes and capacities for a terminal that handles marine containers both "lifts" and "TEUs" are used as units of measure. This is because TEU is a commonly accepted unit of measure for container volumes. However, marine containers come in different sizes (20-foot, 40-foot, and 45-foot lengths) so a 40-foot container is actually 2 TEUs. Lifts measures the actual number of containers or trailers "lifted" onto trains. Thus a 40-foot container would represent one lift and 2 TEUs. Since intermodal yards load a mix of different sizes of containers, and average of 1.875TEUs per lift is used to convert between two units.

Figure 6.14 Project Site Area for Southern California International Gateway (SCIG) Terminal Project

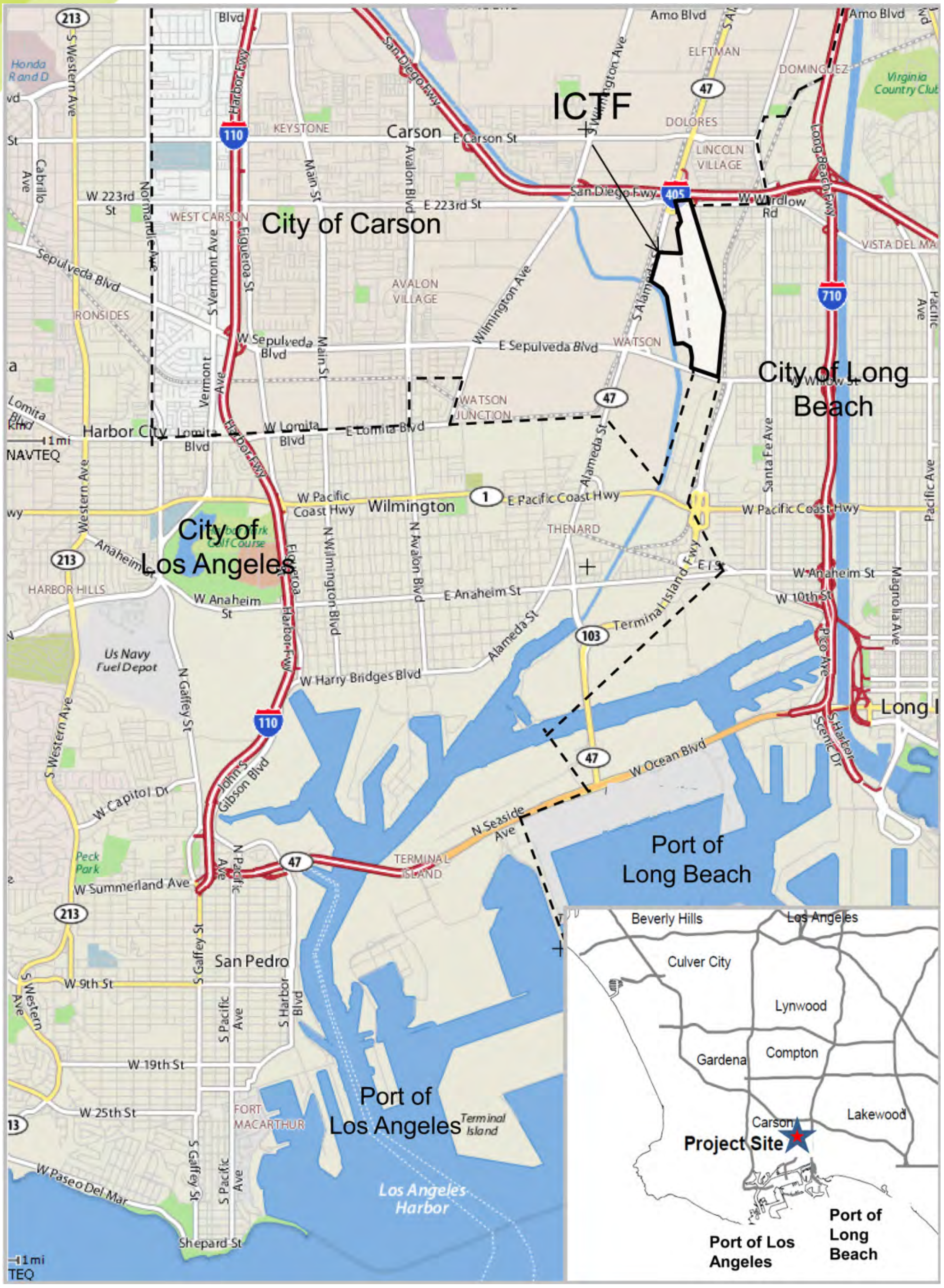
Source: Port of Los Angeles web site: http://www.portoflosangeles.org/EIR/SCIG/DEIR/APPENDIX_E.pdf.

The Intermodal Container Transfer Facility (ICTF) is an existing near-dock intermodal rail facility located approximately five miles from the POLA and the POLB, at the terminus of State Route 103 (SR 103), the Terminal Island Freeway (See Figure 6.15).[24]

The existing ICTF is located on 148 acres of POLA land subleased by Union Pacific from the Joint Powers Authority (JPA) and with other supporting uses located in the City of Carson, either purchased or leased from the Watson Land Company.

[24] Intermodal Container Transfer Facility – Joint Powers Authority's web site for Intermodal Container Transfer Facility Modernization (ICTF) Project: http://www.ictf-jpa.org/project_description.php (last accessed on February 6, 2012).

Figure 6.15 Project Site Area for Intermodal Container Terminal Facility (ICTF) Modernization and Expansion Project



Source: ICTF – JPA.

Union Pacific has proposed to modernize and expand the ICTF. The railroad company expects that the ICTF project will increase the annual average number of container lifts handled from truck to rail transportation from the present 800,000 per year to a projected 1.5 million per year, or 2.8 million TEUs. Despite this increase in capacity, the ICTF's operational footprint will shrink under the proposed Project to 177 acres from its current 233-acre area.

UP has proposed that project construction would occur in multiple stages of approximately four to six months each. Starting in 2017, construction would take approximately three years with completion by 2020.

6.9.2 Benefits

The SCIG and ICTF would have similar benefits. The projects would significantly reduce truck traffic on I-710. Marine containers would be trucked only about five miles from the ports as opposed to over 20 miles from the ports to BNSF's Hobart Yard and UP's East Los Angeles Yard near downtown Los Angeles. This reduces congestion, accidents, and air pollution. The projects would also increase the use of the Alameda Corridor for the efficient and environmentally sound transportation of cargo between the San Pedro Bay Ports and the rest of the U.S. The facilities would also help to maintain the San Pedro Ports' competitive position relative to other gateways for international cargo.

In addition, these projects will use the latest intermodal yard technology, including electric wide-span gantry (WSG) cranes would substantially increase container transfer efficiency and dramatically reduce air emissions and noise generation.

6.9.3 Evaluation

Both projects are undergoing detailed environmental review through the formal CEQA process.

6.9.4 Next Steps

The SCIG DEIR has been re-circulated and the ICTF DEIR is being prepared. The ICTF DEIR should be released in early 2013.

6.10 Rail-Highway Grade Separations

6.10.1 Project Description

At-grade railroad crossings pose several problems for communities in terms of delay to motor vehicles (including emergency vehicles), noise from train whistles, emissions from idling vehicles waiting for trains to pass, and the potential for accidents. Persistent delays at rail crossings can also have a negative effect on the business climate of an area.

Seventy-one grade separation projects, totaling $5.6 billion, are included in the financially constrained plan and are listed in Table 6.15 and mapped in Figure 6.16. The table shows the estimated timeframe for completion: short-term (2012-2019), medium-term (2020-2027), or long-term (2028-2035 and beyond).

Table 6.15 Proposed Grade Separations in SCAG Region
Financially Constrained Plan, By Project

Sequence No.	County	Project Description	Timeframe (Short, Medium, Long)
1	Los Angeles	Valley View Avenue	S
2	Los Angeles	Reeves Avenue	S
3	Los Angeles	South Wilmington Area (bounded by Harry Bridges Boulevard to the north, Pier A Street to the south, Fries Avenue to the west, and Marine Avenue to the east)	S
4	Los Angeles	Mission Boulevard[a]	S
5	Los Angeles	Greenwood Avenue	M
6	Los Angeles	Baldwin Avenue (in City of El Monte)	S
7	Los Angeles	Ramona Street	S
8	Los Angeles	Mission Road	S
9	Los Angeles	Del Mar Avenue	S
10	Los Angeles	San Gabriel Boulevard	S
11	Los Angeles	Puente Avenue	M
12	Los Angeles	Nogales Street	S
13	Los Angeles	Turnbull Canyon Road	M
14	Los Angeles	Fairway Drive	M
15	Los Angeles	Fairway Drive	M
16	Los Angeles	Fullerton Road	M
17	Los Angeles	Hamilton Boulevard	M
18	Los Angeles	Durfee Avenue	M
19	Los Angeles	Del Amo Boulevard	S
20	Los Angeles	Passons Boulevard	Recently Completed
21	Orange	Kraemer Boulevard	S
22	Orange	Lakeview Avenue	S
23	Orange	Placentia Avenue Undercrossing	S
24	Orange	Raymond Avenue	S
25	Orange	State College	S
26	Orange	Tustin Avenue/Rose Drive	S
27	Orange	Jeffery Road	Recently Completed
28	Orange	Orangethorpe Avenue	S
29	Riverside	Auto Center Drive	S
30	Riverside	Iowa Avenue	S
31	Riverside	Magnolia Avenue	S
32	Riverside	Mary Street	S
33	Riverside	McKinley Street (engineering only)	L
34	Riverside	Clay Street	S
35	Riverside	Riverside Avenue	S
36	Riverside	Streeter Avenue	S
37	Riverside	Avenue 52	S

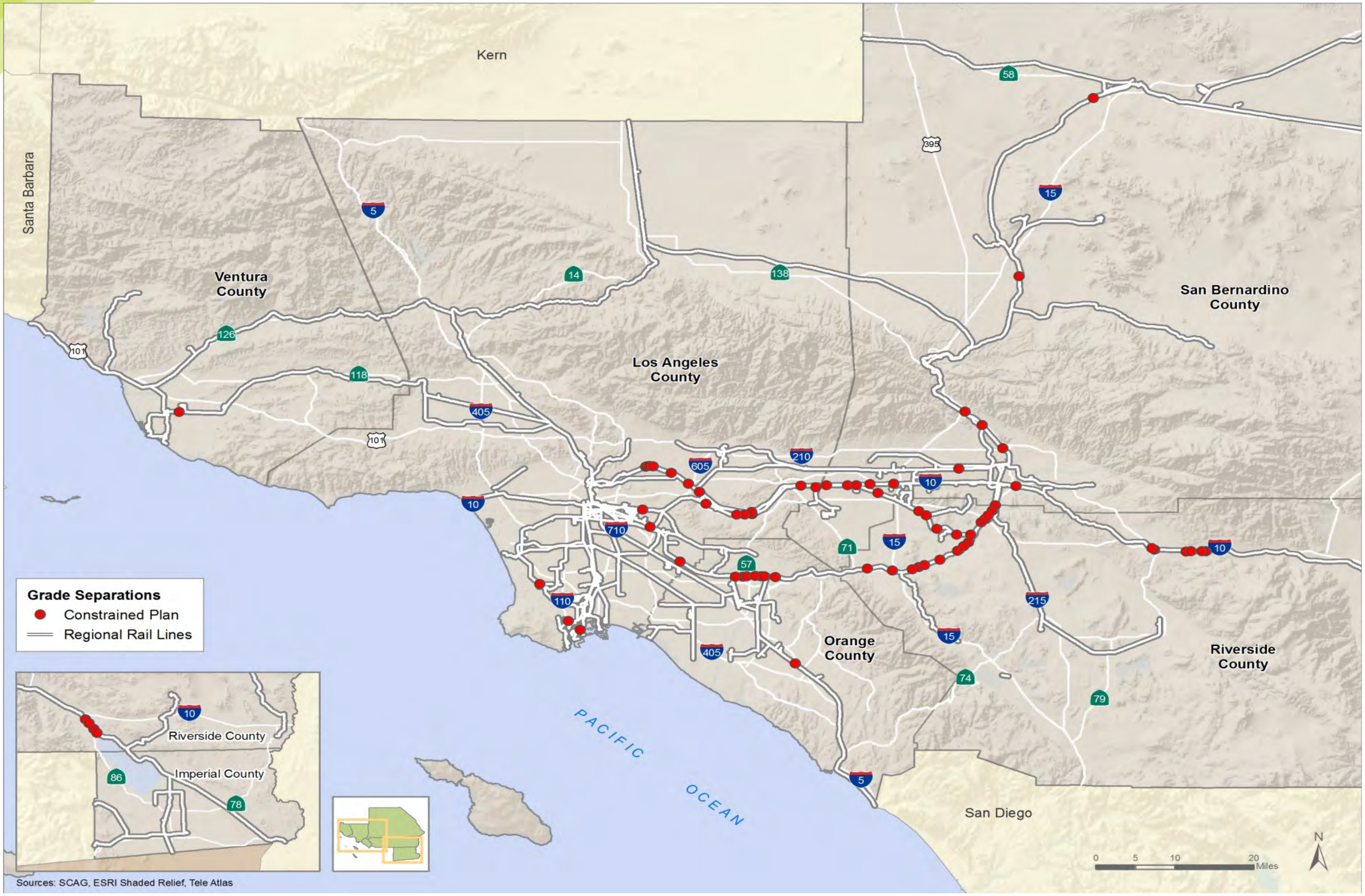
Table 6.15 Proposed Grade Separations in SCAG Region (continued)
Financially Constrained Plan, By Project

Sequence No.	County	Project Description	Timeframe (Short, Medium, Long)
38	Riverside	Avenue 56	S
39	Riverside	Sunset Avenue	S
40	Riverside	Chicago Avenue	L
41	Riverside	Pierce Street	L
42	Riverside	Bellgrave Avenue	L
43	Riverside	Madison Street	L
44	Riverside	Spruce Street	L
45	Riverside	Jurupa Road	L
46	Riverside	Tyler Street	L
47	Riverside	Joy Street	L
48	Riverside	Adams Street	L
49	Riverside	Viele Avenue	L
50	Riverside	California Avenue	L
51	Riverside	22nd Street	L
52	Riverside	San Gorgonio Avenue	L
53	Riverside	Hargrave Street	L
54	Riverside	Avenue 62	L
55	Riverside	Avenue 66	L
56	Riverside	3rd Street	L
57	San Bernardino	Glen Helen Parkway	S
58	San Bernardino	Green Tree Boulevard Extension (engineering only) New Crossing	M
59	San Bernardino	Lenwood Road	S
60	San Bernardino	Palm Avenue	S
61	San Bernardino	Laurel Street	S
62	San Bernardino	Mt. Vernon Avenue	S
63	San Bernardino	Main Street	L
64	San Bernardino	North Vineyard Avenue	S
65	San Bernardino	South Milliken Avenue	S
66	San Bernardino	South Archibald Avenue	S
67	San Bernardino	Campus Avenue	L
68	San Bernardino	Hunts Lane	S
69	San Bernardino	San Antonio Avenue	L
70	San Bernardino	Ramona Avenue at State Street	Recently Completed
71	Ventura	Rice Avenue/Fifth Street	S

[a] *Mission Boulevard in Pomona is not a highway-rail grade separation. It separates SR 71 from Mission Boulevard.*

Note: Projects are not listed in order of priority.

Figure 6.16 Proposed Grade Separations in SCAG Region
Financially Constrained Plan



6.10.2 Benefits

As part of the SCAG 2012-2035 RTP/SCS, grade separation needs and benefits were identified and evaluated. Table 6.15 summarizes the benefits of the 71 proposed grade separations in the region. If these projects had been in place in 2010, a total of 1,356 vehicle hours of delay per day (VHDD) could have been avoided. If constructed these projects could result in a reduction of 5,782 VHDD by 2035, or an average of 81.4 VHDD per project. The project with the largest estimated reduction in VHDD is McKinley Street in Riverside County. Additional detail about these calculations are included as an appendix to this report.

The 71 projects also have the potential for lowering emissions from idling vehicles. By 2035, emissions from NO_x, $PM_{2.5}$, and CO_2 could be reduced by 22,789 g/day combined if all the projects were built.

6.10.3 Evaluation

Cambridge Systematics' "At Grade" model was used to compute the vehicle hours of delay at all grade crossings between downtown Los Angeles and Barstow to the north and Indio to the east for 2010 and 2035. Details of the calculations and methodology are available in a technical memorandum on grade crossing delays.[25]

Delay at a grade crossing depends on the number, length and speed of trains, as well as the number of vehicles crossing the tracks and the number of lanes available for storing traffic queues. Intermodal (container) train volumes were estimated using Cambridge Systematics' "Train Builder" Model, which allocates containers and trailers to individual rail yards. The model then "builds" trains of various lengths which are then assigned to mainline rail tracks in the region. Estimates of non-intermodal freight trains and passenger trains were also made and assigned to tracks. The combined effects of all freight and passenger trains on grade crossing delays were then evaluated.

6.10.4 Next Steps

Various agencies and individual jurisdictions have responsibility for building grade separations in the SCAG region. They will continue to seek necessary funding for implementation.

6.11 2012 RTP Goods Movement Project List

Table 6.16 is a listing of the final Goods Movement Project List. Figures 6.17 to 6.20 show maps of the locations of these projects.

---

[25] Cambridge Systematics, Inc., *Technical Memorandum: Documentation of SCAG Grade Crossing Impacts Assessment, 2010 and 2035*, May 22, 2012.

Table 6.16 Final 2012 RTP Goods Movement Project List

Map ID	County	Project Description	Project Cost ($YOE, in Thousands)	Timeframe (Short, Medium, Long)
A. Roadway Access to Major Goods Movement Facilities				
A.1	Los Angeles	I-5: Phase 1 of 3 – in Santa Clarita from SR 14 to Pico Canyon/Lyons Avenue in the southbound direction and from SR 14 to Gavin Canyon Road in the northbound direction; construct truck climbing lanes.	$131,000	S
A.2	Los Angeles	I-5: Phases 2 and 3 of 3 – in LA/Santa Clarita: Phase 2 (northbound from SR 14 to Weldon Canyon Road; construct HOV lane) and Phase 3 (from SR 14 to Parker Road Overcrossing; construct HOV, truck, and auxiliary lanes.	$410,000	S
A.3	Los Angeles	SR 47 Expressway: replacement of Schuyler Heim Bridge (Segment 1) to include 2 through lanes and 1 auxiliary lane northbound; and 3 through lanes and 1 auxiliary lane southbound; ACTA completing preliminary engineering (PE), right-of-way (ROW), and design support during construction; bridge replacement – no additional lanes added. Construct expressway (Segment 2 – ACTA only) and 2-lane flyover (Segment 3 – ACTA only).	$416,800	S
A.4	Los Angeles	SR 47: replacement of Schuyler Heim Bridge to include 2 through lanes and 1 auxiliary lane northbound; and 3 through lanes and 1 auxiliary lane southbound.	$278,993	S
A.5	Los Angeles	Widen and reconstruct Washington Boulevard from western city boundary at Vernon (350 feet west of Indiana Street) to I-5 at Telegraph Road; widen from 2 lanes to 3 lanes in each direction, increase turn radius and medians, upgrade traffic signals and street lighting, and improve sidewalks.	$32,000	S
A.6	Los Angeles	Ocean Boulevard, from the Los Angeles River over Union Pacific Railroad (UPRR) and Back Channel, to 0.1 mile east of SR 47; replace 5 lane existing Gerald Desmond Bridge with new 6 lane bridge (3 lanes in each direction); other improvements include construction of new approach structures and roads, reconstruction of the existing horseshoe interchange ramp connectors, reconstruction of the existing connectors to SR 710, and reconstruction of 2 ramp connections to Pico Avenue.	$1,001,617	S
A.7	Los Angeles	Olympic Boulevard and Mateo Street Goods Movement Improvement – Phase II; improvement of freeway access by widening westbound Olympic Boulevard between Mateo Street and Santa Fe Avenue for a right-turn lane and northbound Mateo Street between Olympic Boulevard and Porter Street for increased curb return.	$4,421	S
A.8	Los Angeles	At I-110 northbound at John S. Gibson Boulevard northbound ramps and northbound SR 47/I-110 Connector; widen SR 47 to northbound I-110 Connector from 1 to 2 lanes from SR 47 PM 0.72 (Station 535+00) just west of Front Street on-ramp; additional through lane continues on northbound I-110 and ends just north of the John S. Gibson off-ramp; widen northbound I-110/John S. Gibson on-ramp to improve access to freeway and intersection of John S. Gibson/I-110 northbound ramps with improved turn radii and re-striping.	$35,051	S

Table 6.16 Final 2012 RTP Goods Movement Project List (continued)

Map ID	County	Project Description	Project Cost ($YOE, in Thousands)	Timeframe (Short, Medium, Long)
A.9	Los Angeles	I-110 C Street Access Ramps Improvement: improve flow of traffic from I-110 on/off-ramps at C Street by consolidating 2 closely spaced intersections into 1.	$23,980	S
A.10	Los Angeles	Reconstruct SR 60/Grand Avenue Interchange – widen Grand Avenue: add 1 though lane southbound (2 existing), add 1 through lane northbound (3 existing); replace Grand Avenue Overcrossing, add eastbound loop on-ramp, construct additional eastbound through lane from Grand Avenue trap lane to SR 57 add lane, add 2 bypass ramp connectors, add auxiliary lanes eastbound and westbound from east of and west of the junction of the confluence.	$257,900	L
A.11	Los Angeles	I-605 Corridor "Hot Spot" interchanges in Gateway Cities.	$3,200,000	M
A.12	Los Angeles	I-710 Early Action Projects.	$687,000	M
A.13	Los Angeles	Construction of interchange at SR 47/Navy Way.	$47,800	S
A.14	Los Angeles	New westbound SR 47 on- and off-ramps at Front Street just west of the Vincent Thomas Bridge and eliminate the existing non-standard ramp connection to the Harbor Boulevard off-ramp. Front Street north of the new intersection will be modified to provide 2 northbound lanes, 2 southbound lanes and an exclusive right-turn lane. Front Street south of the new intersection will be modified to provide 1 northbound lane, 2 northbound left-turn lanes and 2 southbound lanes.	$23,800	L
A.15	Los Angeles	Alameda Street between I-10 and Seventh Street in City of Los Angeles. Project will provide congestion relief, improve mobility/reduce conflicts, and improve safety for both automobiles and trucks by providing intersection improvements, new signalization improvements and left turn only signals. Project will also remove abandoned rail lines, repair pavement, add new street lighting, and construct pedestrian improvements.	$7,132	S
A.16	Orange	SR 57 truck climbing auxiliary lane from Lambert Road to Los Angeles County line.	$124,600	L
A.17	Orange	Add 1 mixed flow lane on northbound SR 57 from 0.4 mile north of SR 91 to 0.1 mile north of Lambert Road (5.1 miles) (SR 91/Orangethorpe Avenue to Yorba Linda Boulevard segment).	$72,208	S
A.18	Orange	Add 1 mixed flow lane on northbound SR 57 from 0.4 mile north of SR 91 to 0.1 mile north of Lambert Road (5.1 miles) (Yorba Linda Boulevard to Lambert Road segment).	$73,243	S
A.19	Orange	Connect existing auxiliary lane through interchanges on westbound SR 91 between SR 57 and I-5 with intelligent transportation systems (ITS) elements.	$73,400	S
A.20	Orange	I-5 from El Toro Road truck bypass to SR 55: add 1 mixed flow lane in each direction and merging improvements.	$298,025	M
A.21	Orange	SR 57 northbound: widen existing 4 mixed flow lanes to 5 mixed flow lanes from 0.3 miles south of Katella Avenue to 0.3 miles north of Lincoln Avenue.	$41,086	S

Table 6.16 Final 2012 RTP Goods Movement Project List (continued)

Map ID	County	Project Description	Project Cost ($YOE, in Thousands)	Timeframe (Short, Medium, Long)
A.22	Orange	SR 91: add 1 mixed flow lane eastbound between SR 91/SR 55 Connector and SR 241 and westbound between SR 241 and Imperial Highway; modify westbound on-ramps from Lakeview Avenue to improve merge (add auxiliary lane between northbound SR 55 and eastbound SR 91 on-ramp and Lakeview Avenue off-ramp).	$85,986	S
A.23	Orange	SR 91: add 1 mixed flow lane eastbound; improve interchange at SR 91/SR 55 and Lakeview Avenue; operational, no increase in capacity.	$355,764	M
A.24	Orange	I-5: add 1 lane in each direction (SR 57 to SR 91).	$336,904	L
A.25	Orange	SR 91 westbound (SR 55 through Tustin Avenue interchange) extend lane and reconstruct auxiliary lane.	$41,930	S
A.26	Orange	SR 91 in Orange County: add a westbound mixed flow lane from SR 241 off-ramp to Gypsum Canyon Road and auxiliary lanes in each direction between SR 241 and Orange County/Riverside County line. See Riverside County for additional improvements.	$173,728	S
A.27	Orange	SR 91 eastbound lane addition between SR 241 and SR 71, and improve northbound SR 71 Connector from SR 91 to standard 1 lane and shoulder width.	$77,575	S
A.28	Orange	I-5: add 2 mixed flow lanes in both direction from Avery Parkway to Alicia Parkway; extend second HOV lane from El Toro Road to Alicia Parkway in both directions; and reconfigure interchanges at Avery Parkway and La Paz Road.	$558,700	M
A.29	Orange	SR 55: add 1 mixed flow lane in each direction and fix chokepoints from I-405 to SR 22; add 1 auxiliary lane in each direction between select on/off ramps through project limits (I-405 to SR 91).	$343,055	M
A.30	Orange	I-405: add 1 mixed flow lane in each direction from I-5 to SR 55 to improve merging.	$374,540	M
A.31	Orange	I-405: add 1 mixed flow lane in each direction from SR 73 to I-605.	$1,694	M
A.32	Orange	I-405: construct fourth northbound through lane on Beach Boulevard at I-405 interchange and remove off-ramp on I-405 at Beach Boulevard (northeast corner of Beach Boulevard and Edinger Avenue).	$1,500	S
A.33	Riverside	On I-10 near Beaumont: add/construct new eastbound truck climbing lane from San Bernardino County line to I-10/SR 60 junction.	$26,000	M
A.34	Riverside	On SR 60 near Beaumont: construct new eastbound and westbound truck lanes from Gilman Springs Road to 1.6 miles west of Jack Rabbit Trail.	$100,000	S
A.35	Riverside	Construct new interchange at I-10/SR 60 junction/split.	$184,464	L
A.36	Riverside	On Van Buren Boulevard near March Air Reserve Base: widen from 4 to 6 lanes from approximately 0.5 miles west of I-215 to Barton Street.	$6,700	S

Table 6.16 Final 2012 RTP Goods Movement Project List (continued)

Map ID	County	Project Description	Project Cost ($YOE, in Thousands)	Timeframe (Short, Medium, Long)
A.37	San Bernardino	I-10/Cherry Avenue interchange reconstruction – replace overcrossing, widen overhead and widen interchange from Slover Avenue to Valley from 4 to 6 lanes with double left-turns to ramps.	$84,090	S
A.38	San Bernardino	I-15/I-215 interchange improvements – Devore Interchange south of Glen Helen Parkway to north of Kenwood Avenue and I-215 from south of Devore Road Interchange to I-15 (16.0-17.8); add 1 mixed flow lane in each direction to existing 3 mixed flow lanes from 3,800 feet south of Glen Helen Parkway to 3,100 feet north of I-215 Interchange; add 1 deceleration lane from 3,200 feet south of I-15/I-215 interchange off-ramp to southbound Devore on I-215.	$324,273	S
A.39	San Bernardino	On I-10: Add a truck climbing lane from Live Oak Avenue to Riverside County Line.[a]	$30,000	L
A.40	Ventura	U.S. 101: in Oxnard at Rice Avenue (Santa Clara Avenue); reconstruct interchange.	$83,977	S
A.41	Ventura	Hueneme Road from Oxnard city limits to Rice Road – widen from 2 to 4 lanes.	$6,953	L
A.42	Ventura	Hueneme Road from Saviers Road to Arcturus Avenue – widen from 2 to 4 lanes.	$3,179	S
A.43	Imperial	Widen SR 111 from SR 98 to I-8 with interchange improvements.	$997,259	L
A.44	Imperial	Expansion of the Calexico East Port of Entry – the proposed project is to increase the number of commercial vehicle inspection lanes and booths from the existing 3 to 6 lanes and booths; and widen bridge over the All-American Canal, which serves as U.S./Mexico Border.[a]	$90,000	L
Subtotal – Roadway Access to Major Goods Movement Facilities			*$11,528,327*	–
B. Freight Corridor System				
B.1	Los Angeles	I-710 Corridor User-fee Backed Capacity Enhancement – widen to 5 mixed flow plus 2 dedicated lanes for clean technology trucks (in each direction) and interchange improvements, from Ocean Boulevard in Long Beach to the intermodal railroad yards in Commerce/Vernon.	$5,580,000	L
B.2	Various	East-West Freight Corridor Segment 1 (UPRR Adjacent Segment).	$2,413,086	L
B.3	Various	East-West Freight Corridor Segment 2 (SR 60 Adjacent).	$9,102,359	L
B.4	Various	East-West Freight Corridor Segment 3 (SR 60 Adjacent).	$3,777,816	L
B.5	Various	I-15 Freight Corridor (Initial Segment).	$856,570	L
Subtotal – Freight Corridor System			*$21,729,831*	–

Table 6.16 Final 2012 RTP Goods Movement Project List (continued)

Map ID	County	Project Description	Project Cost ($YOE, in Thousands)	Timeframe (Short, Medium, Long)
C. Zero-Emission Technology				
C.1	Los Angeles	Zero-Emission Container Movement: near-term technology demonstration and initial deployment. Demonstration by 2013; initial deployment by 2015.	$35,000	M
Subtotal – Zero-Emission Technology			*$35,000*	–
D. Off-Dock and Near-Dock Intermodal Yard Projects				
D.1	San Bernardino	Track and intermodal yard improvements (Phases 1 through 4).	$673,305	L
D.2		Southern California Logistics Airport (SCLA) rail service from Air Expressway approximately 5 miles north of Colusa Road between Phantom East and Mojave River – put in new rail line from BNSF to SCLA (for freight); project in connection with new intermodal/multimodal facility on SCLA property.	*$250,000*	*S*
D.3	Los Angeles	Near-dock railyard improvements/intermodal facilities (SCIG/ICTF).	$1,000,000	S
Subtotal – Off-Dock and Near-Dock Intermodal Yard Projects			*$1,923,305*	–
E. Mainline Rail				
E.1-A to E.1-N	Various	Rail package – mainline rail capacity expansion: Colton rail-to-rail grade separation–BNSF Cajon Subdivision; Barstow to Keenbrook–BNSF San Bernardino Subdivision; Colton Crossing to Redondo Junction–UP Mojave Subdivision; Devore Road to West Colton (including Rancho Flying Junction)–UP Alhambra Subdivision; West Colton to City of Industry–UP Los Angeles Subdivision; UP Yuma Subdivision.	$3,092,400	–
E.2	San Bernardino	Colton Crossing: in Colton from 0.2 miles (0.3 KM) west of Rancho Avenue to 0.9 miles (1.5 KM) east of La Cadena Drive; construct railroad to railroad grade separation; (Cost included in the Rail package – mainline rail capacity expansion).	*$201,994*	*S*
E.3	Orange	BNSF Line – 10 miles of triple track from Fullerton to Orange/Riverside County line; (Same as Atwood to Fullerton and Esperanza to Fullerton); (Cost included in the Rail package – mainline rail capacity expansion).	*$70,000*	*L*
Subtotal – Mainline Rail			*$3,092,400*	–
F. On-Dock Rail				
–	Los Angeles	Other In-Port Mainline (On-Dock Railyards):	–	–
F.1-LB		Pier G New North Working Yard.	–	*S*
F.2-LB		Pier G South Working Yard Rehabilitation.	–	*M*
F.3-LB		Middle Harbor Terminal Rail Yard (3 Phases).	–	*M*

Table 6.16 Final 2012 RTP Goods Movement Project List (continued)

Map ID	County	Project Description	Project Cost ($YOE, in Thousands)	Timeframe (Short, Medium, Long)
F.4-LB		Pier A On-Dock Rail Yard Expansion To Carrack.	–	*TBD*
F.5-LB		Pier A On-Dock Rail Yard East of Carrack.	–	*TBD*
F.6-LB		Pier S On-Dock Rail Yard.	–	*TBD*
F.7-LB		Pier J On-Dock Rail Yard Reconfiguration.	–	*TBD*
F.8-LB		Pier G Metro Track Improvements.	–	*S*
F.9-LA		Pier 400 On-Dock Rail Yard Expansion (Phase 1).	–	*L*
F.10-LA		Pier 300 On-Dock Rail Yard Expansion.	–	*L*
F.11-LA		Pier 400 On-Dock Rail Yard Expansion (Phase II).	–	*L*
F.12-LA		West Basin ICTF Rail Yard Expansion (Phase 1) – TraPac On-Dock Rail Project.	–	*S*
Subtotal – On-Dock Rail			*$998,100*	–
G. Rail Access Improvements to Port of Long Beach and Port of Los Angeles				
G.1	Los Angeles	Port Truck Traffic Reduction Program: West Basin Railyard. Intermodal railyard connecting Port Of LA with Alameda Corridor to accommodate increased loading of trains at the port, reducing truck trips to off-dock railyards.	–	S
-	Los Angeles	Ports Rail System (Outside Marine Terminals):	–	–
G.2-LA		Pier 400 Second Lead Track	–	L
G.3-LB		Pier B Street Realignment – Pier B Street Intermodal Railyard Expansion. Project will expand Pier B Street Intermodal Railyard to facilitate additional rail shipments and realign and widen Pier B Street.	–	S
G.4-LB		Pier F Support Yard – this project provides storage tracks on the Pier F Road cul-de-sac, which are useful for support functions such as set out of bad order rail cars and possibly engine tie-up.	–	S
G.5-LB		Track Realignment at Ocean Blvd – this project will create improved lead tracks to the Metropolitan Stevedoring Co. (Metro) rail yard and to Pier F on-dock rail yard.	–	S
G.6-LB		Terminal Island Wye Track Realignment – this project will provide for double tracking the south leg of the Wye to accommodate simultaneous train switching moves from these various activities on Terminal Island.	–	TBD
G.7-LB		Reconfiguration of Control Point (CP) Mole – the new control point at the Mole will enable increased train speeds and reduced train delays caused by manual switch operations.	–	TBD

Table 6.16 Final 2012 RTP Goods Movement Project List (continued)

Map ID	County	Project Description	Project Cost ($YOE, in Thousands)	Timeframe (Short, Medium, Long)
G.8-LB		Navy Mole Road Storage Yard – the proposed project includes three new tracks along the west side of Pier T. This project will also involve relocating the existing utilities.	–	TBD
G.9-LB		Pier B Rail Yard (Phase II – 9th Street Alternative) expansion of Pier B Street intermodal railyard.	–	S
G.10-LB		Pier B Rail Yard (Phase III – 10th/12th Street Alternative) expansion of Pier B Street intermodal railyard.	–	M
Subtotal – Rail Access Improvements to Port of Long Beach and Port of Los Angeles			*$1,537,900*	–
H. Rail-Highway Grade Separations				
H.1 to H.71	Various	Rail Package – Grade Separations (see detailed list).	$5,568,900	–
Subtotal – Rail-Highway Grade Separations			*$5,568,900*	-
I. Bottleneck Relief Projects				
I.1 to I.22	Various	Goods Movement – Bottleneck Relief Strategy.[b]	$5,000,000	–
Subtotal – Bottleneck Relief Projects			*$5,000,000*	–
J. Future Initiative That Could Serve Goods Movement				
J.1	Los Angeles/ San Bernardino	High Desert Corridor ~~– construct new 4-6 lane facility: east-west facility between SR 14 and U.S. 395 (connecting at San Bernardino County); east-west facility between I-5 and SR 14; and north-south facility between SR 14 and SR 138.~~	$6,925,029	M
Subtotal – Future Initiative That Serve Goods Movement			*$6,925,029*	–
TOTAL GOODS MOVEMENT PROJECTS			*$58,338,792*	–

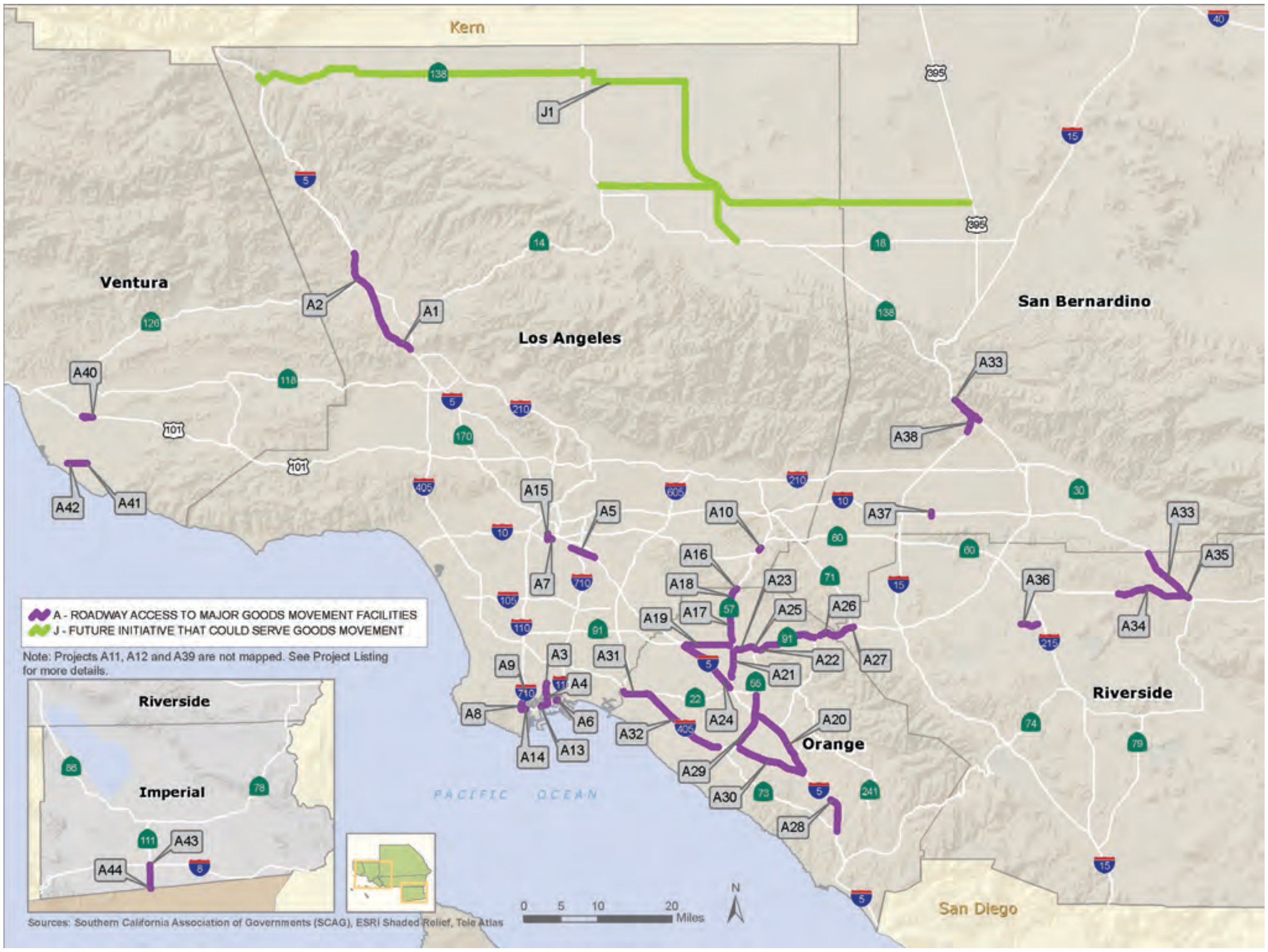
Note: Projects not listed in the order of priority. Projects A.11, A.12, A.39, C.1, D.1, and G.1 are not mapped.

[a] *All projects are included in 2012-2035 Regional Transportation Plan/Sustainable Communities Strategy (RTP/SCS) adopted on April 4, 2012, except Project IDs A.39 and A.44; Inclusion of these projects in the RTP/SCS are subject to future amendments.*

[b] *The 2012–2035 RTP/SCS includes an estimate of $5 billion for goods movement bottleneck relief strategies. See examples of initially identified truck bottleneck relief projects.*

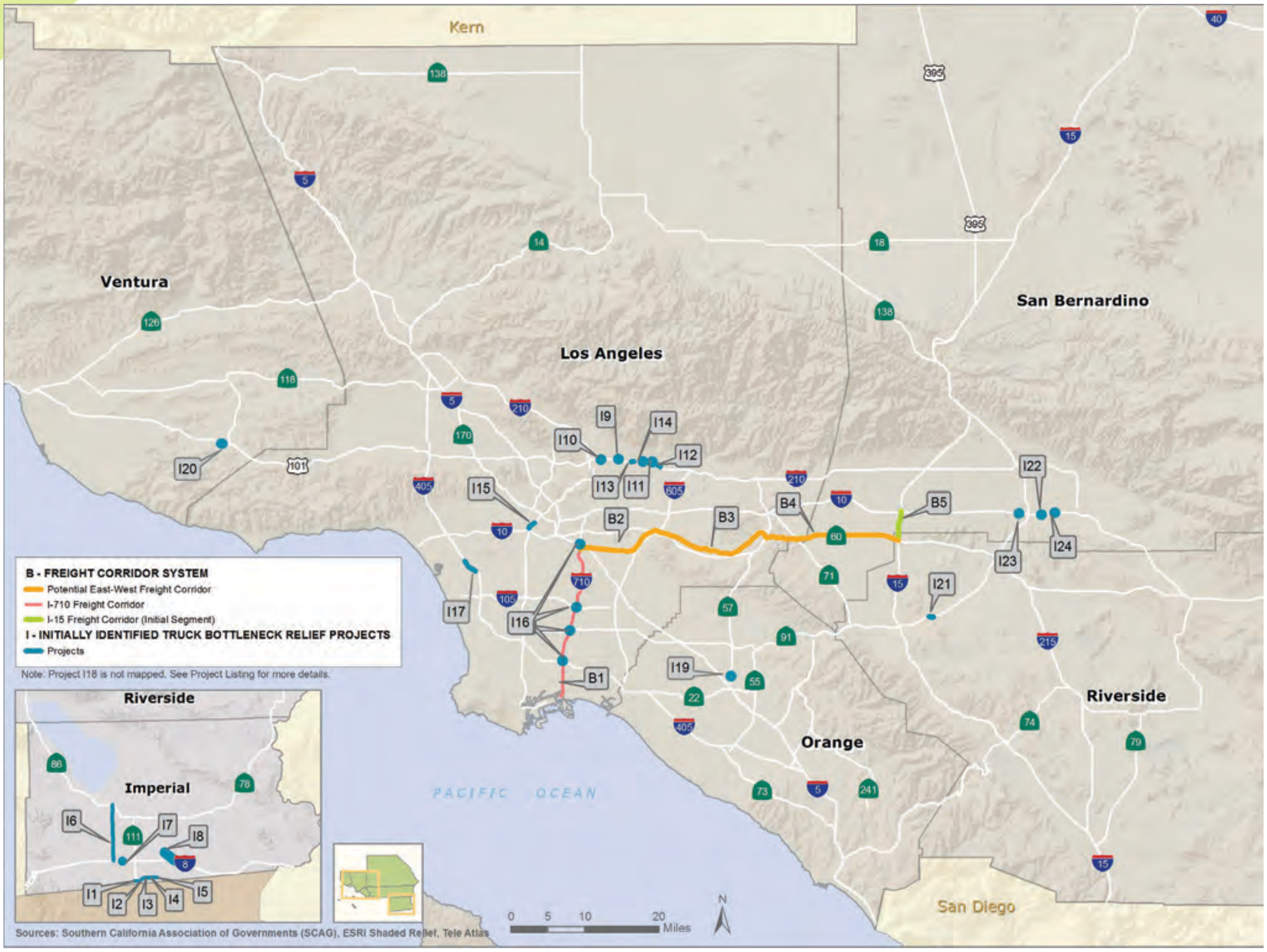
Figure 6.17 Goods Movement Project List

Roadway Access to Major Goods Movement Facilities (A) and Future Initiative That Could Serve Goods Movement (J)



Note: Project Identification corresponds to Project Listing.

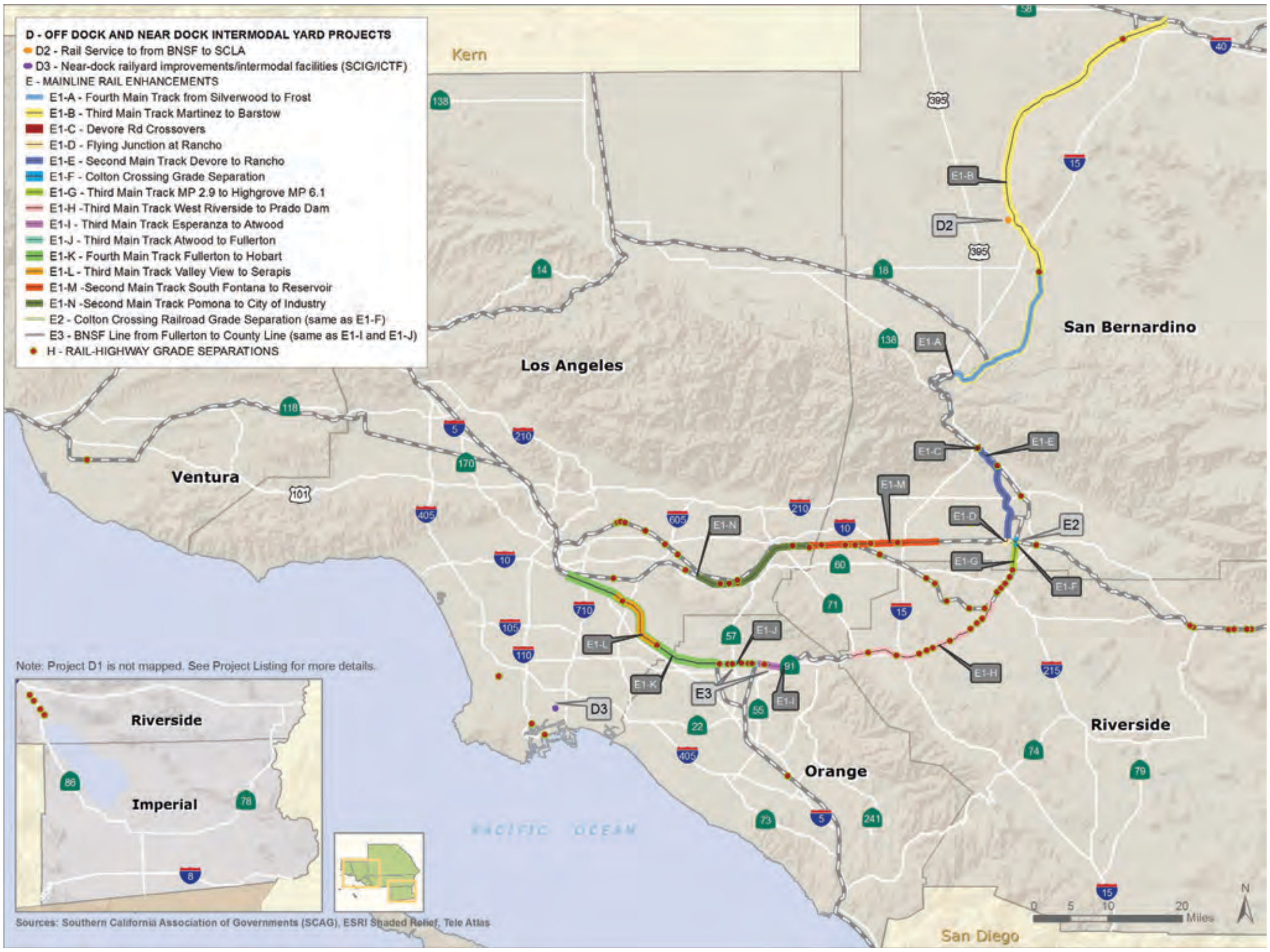
Figure 6.18 Goods Movement Project List
Freight Corridor System (B) and
Initially Identified Truck Bottleneck Relief Projects (I)



Note: Project Identification corresponds to Project Listing.

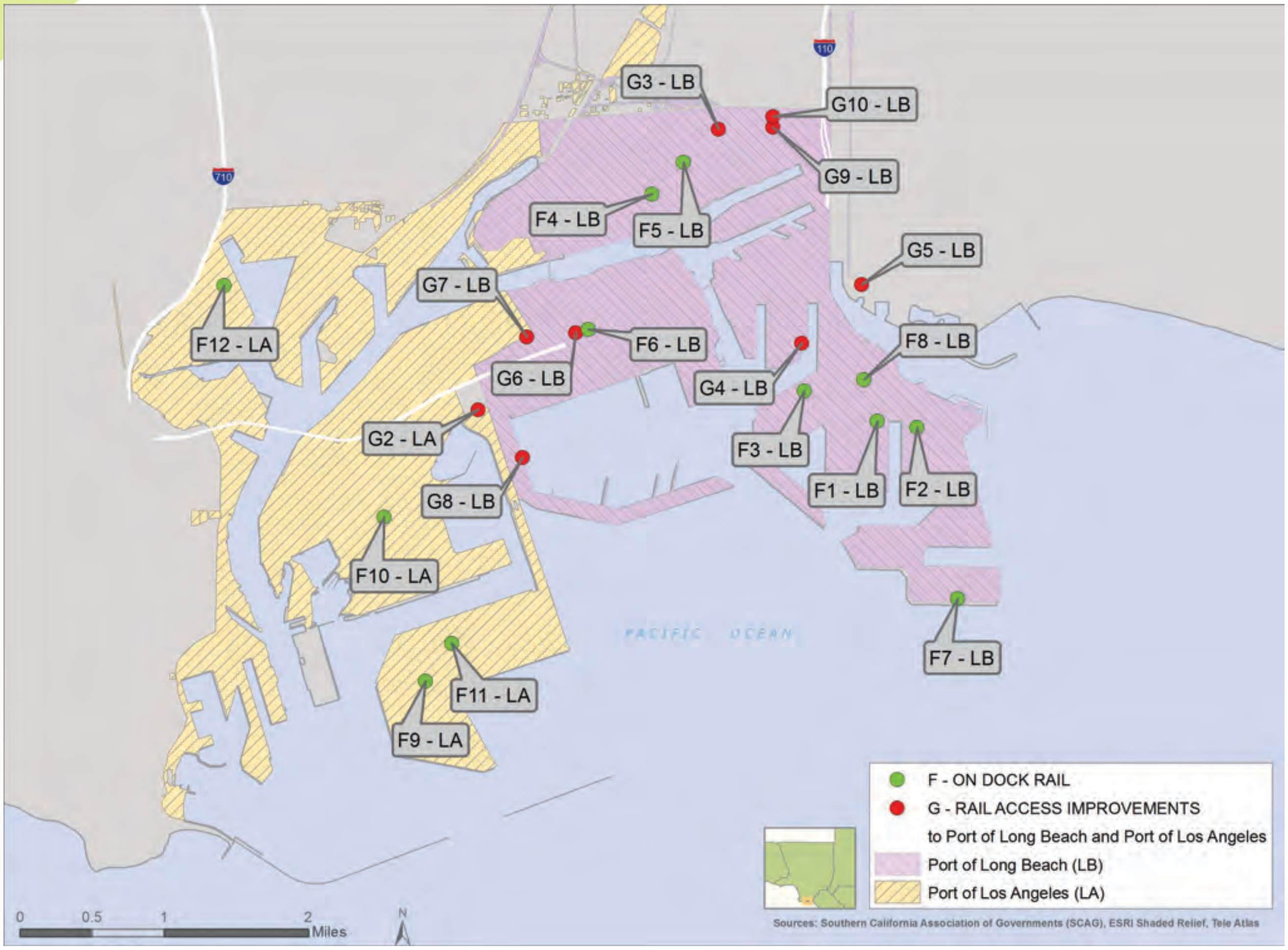
Figure 6.19 Goods Movement Project List

Off-Dock and Near-Dock Intermodal Yard Projects (D), Mainline Rail (E), and Rail-Highway Grade Separations (H)



Note: Project Identification corresponds to Project Listing.

Figure 6.20 Goods Movement Project List
On-Dock Rail (F) and Rail Access Improvements to Port of Long Beach and Port of Los Angeles (G)



Note: Project Identification corresponds to Project Listing.